ARCHIVES OF OPHTHALMOLOGY.

A CASE OF PARALYSIS OF DIVERGENCE: ITS BEARING UPON THE THEORY OF SQUINT AND HETEROPHORIA.

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(*With a text figure.*)

THE case here given is reported, not so much because it is rare, for similar cases have long been known, and the explanation of them here advocated has been given by Parinaud and Uhthoff (5). These cases, however, are highly interesting from the light they throw upon the pathogenesis of periodic squint; and the one here reported will be used mainly as a text to introduce certain considerations bearing upon the latter subject.

STRABISMUS CONVERGENS OF SIX YEARS' STANDING DUE TO PARALYSIS OF DIVERGENCE. ASSOCIATED LATERAL MOVEMENTS AND CONVERGENCE UNAFFECTED. BEGINNING TABES.

Mrs. J. H., aged thirty-five, married. Seen at my office, Nov. 19, 1898.

History.—Six years ago attack of neuralgia, associated with numbness and paresis of left arm and with sudden attacks of amblyopia. Then diplopia set in with a gradually increasing convergent squint. Ever since has suffered from various nervous troubles, especially neuralgic pains in the head (hemicrania) and spine (lightning pains).

In January, 1895, examined by Dr. Pischel, of San Francisco, who found an esophoria of 34° for distance, and of 20° for 40 centimetres. After operation, 14° for distance, 0° at 40 centimetres. Pupillary symptoms as now, but pupils slightly unequal. No other evidences of tabes at that time. Dr. Pischel did a tenotomy of the left internus, and later an advancement (capsu-

lar) of the left externus. This producing only an incomplete correction, he very properly proposed to do a similar operation upon the right eye, but this the patient refused.

Head symptoms somewhat relieved by operation, but other symptoms very troublesome. Some of these attributable to uterine and ovarian disease, from which she suffers.

Is using + 0.50 sph. for distance and near.

STATUS PRÆSENS.

Vision.—$\frac{1}{1\,8}$ − each. R. accepts + 0.25 cyl. ax. vert. L. + 0.50 sph. wi. + 0.50. cyl. ax. vert. Under homatropine. R. $\frac{1}{1\,8}$; wi. + 1.25 sph. $\frac{1}{1\,8}$. L. $\frac{1}{1\,8}$; wi. + 1.75 $\frac{1}{1\,8}$. Accepts these glasses after effects of homatropine had worn off.

Field of vision.—Perfectly normal for even the minutest test-objects and all colors.

Exterior of eye.—Normal, except for old macula corneæ L. eye.

Pupils.—Of medium width, and equal. No reaction to light; slight, but distinct, reaction to convergence (Argyll-Robertson pupil).

Fundus.—Normal, except for a well-marked sector of temporal pallor in both discs.

Muscles.—At fifteen feet, esophoria of 25° and 26° by all tests (screen, parallax, Maddox rod, phorometer). L. hyperphoria, 2°. Strictly monocular vision for distance, R. eye alone being used for fixation. No spontaneous diplopia for distance under ordinary conditions, but gets homonymous diplopia with red glass, and also when deviation is partly corrected by a prism of 13° base out.

Esophoria diminishing to 15° when the gaze is directed moderately far to either the right or the left. This diminution in lateral rotation apparent at all distances. Esophoria and the diplopia also diminishing progressively as the test-object is approximated to the eyes until, at a distance from 6″ to 8″, there is single vision and orthophoria. Within this limit there is exophoria. Convergence near-point 2″, or somewhat more from root of nose (*i. e.*, slightly subnormal convergence). For near points, binocular fixation and true binocular single vision.

Field of fixation, field of binocular single vision (at near), and excursion movements of eyes unrestricted in all directions. The outward movement, or abduction, greater than the inward move-

ment (adduction) in each eye, and excursions of L. eye less than R. in both directions (abduction, R. 65°, L. 50°; adduction, R. 45°, L. 40°).

Extra-ocular signs.—Romberg symptom. Absence of knee-jerk. No ataxia.

Subsequent examinations (the last one made Jan. 26, 1899) confirmed the above findings in all respects.

The first fact of importance to be stated with regard to this case is that the conditions present *cannot be ascribed either to paralysis of the externi or to contracture of the interni.* For, if the former was the causal factor, the outward rotation of one or both eyes would have to be curtailed, and considerably too, to produce so marked a deviation. So, too, a contracture of the interni, such as would be competent to produce a squint of this extent, would necessarily be associated with curtailment of the excursion outward coupled with a very decided increase of the excursion inward. But in the case reported the outward excursion of each eye, so far from being restricted, is in excess of the normal; and the degree of actual inward rotation that either eye can perform is certainly not excessive, but rather subnormal.

Furthermore, the fact that the deviation diminishes when the gaze is directed laterally, is a proof that it cannot be due either to paralysis or contracture; for in both these conditions the deviation should increase notably as the eyes are carried toward the side of the paretic or the contractured muscle.

Again, if the squint was due to either of these factors, it ought to be almost, if not quite, as marked for near as far distance. But, as a matter of fact, the deviation diminishes *pari passu*, as the object looked at is approximated to the eyes, and at moderate distances is practically nil.

The same objections hold against the case being regarded as one of *muscular spasm.*

It is plain, therefore, that we must consider it simply as a variety of periodic squint. Looking at it in that light, let us see what is its probable explanation, *i. e.*, what place it occupies in our classification of strabismus.

VON GRAEFE'S MYOPATHIC THEORY OF PERIODIC SQUINT.

Von Graefe, in an early and very exhaustive essay on squint (1) attempted to explain cases of this sort, with all other cases of strabismus, as being purely myopathic. He regarded all cases of strabismus as being due to alterations in the mean length of the muscles. That is, a man has a convergent squint either because his externus is too long or his internus too short. This theory, which apparently fits cases of purely concomitant strabismus, he endeavors to accommodate also to cases of periodic (or, as he calls it, intercurrent) squint.

Von Graefe divides cases of periodic convergent squint into three classes:

A.—Cases in which there is no obvious deviation when the patient is not looking at anything in particular, but in which *deviation at once sets in when he fixes his gaze sharply upon an object*, whether near or distant.

In a certain proportion of these cases, von Graefe says, the deviation represents simply an attempt to exclude one of the double images, which cause no annoyance as long as they are indistinct, but which become disturbing to the patient when, by accurate fixation, he renders them well defined. But this explanation by no means holds good for all cases, since the deviation frequently persists when one eye is excluded by a screen so that there is no diplopia to cause disturbance. Nor can accommodative effort be held accountable for the squint, since the latter occurs at all distances, and also when glasses of varying strength and kind are placed before the eye.[1] Hence, von Graefe argues that the mere act of sharp fixation may, in virtue of the heightening of muscular tensions required in order to keep the eyes fixed, excite an abnormal stimulus to contraction, provided the tendency to such contraction is already resident

[1] I cannot regard these objections as altogether valid. The mere placing of a screen before one eye, while preventing diplopia, does not produce any essential change in other respects; and an eye which had been accustomed to squint, in order to exclude double images, whenever fixation was performed, would very likely still squint as a matter of habit, during fixation unaccompanied by diplopia. Indeed, von Graefe (*l. c.*, p. 284) admits this. And against the second objection, it may be said that an accommodative squint is not always affected at once by the use of glasses.

in the muscle. In other words, the internus has all along a tendency to morbid contraction, which tendency does not assert itself so long as all the muscles are relaxed, but at once becomes manifest when the muscles, owing to the requirements imposed by fixation, are thrown into a state of tension.

B.—Cases in which a pathological *convergence occurs only when accommodation is made for near points.*[1] This is very common—indeed, constitutes the ordinary variety of periodic convergent squint as we see it in hypermetropes, particularly in the young. In the great majority of cases, it is, as von Graefe says, the evidence of an excessive accommodative effort—an effort which, of course, increases as the object looked at is approximated to the eyes.

I cannot, however, admit that excessive accommodation is the only factor that can produce a convergence of this sort, since there are cases, not very frequent to be sure, in which the tendency to converge is not affected by persistent elimination of the accommodative element.

C.—Cases in which the adjustment of the visual axes is *proper up to a certain distance (8 inches, 1 foot, 4 feet), but beyond this distance there is marked convergence.*

This condition, von Graefe says, occurs in the following:

(*a*) Myopes, who for the space within which they can accommodate, adjust their visual axes properly, but beyond this point squint. The muscle energies, being morbidly altered, dispose the eye to deviation, and the eyes follow this natural tendency to deviate as soon as the images are no longer sharp.

(*b*) Unilateral myopia; or anisometropia of any kind.

(*c*) Unilateral opacities of the media or irregular astigmatism, rendering the image in one eye indistinct.

(*d*) Very small changes in the mean lengths of the ocular muscles, producing a degree of tension which can be overcome if a strong effort is made, but which otherwise causes deviation.

In cases *b*, *c*, and *d*, von Graefe argues that when the

[1] For the sake of clearness in discussion, I have reversed von Graefe's order of treating the subject, and have taken up his third class (Category B) before considering his second.

object of vision is sufficiently near the eye the retinal images are made so large as to force themselves upon the attention and demand fusion, and moreover the differences in size of the images and distinctness are then more readily ignored, so that under these conditions binocular fixation takes place; while with the object farther away from the eyes, the natural tendency of the latter to converge asserts itself, and the patient squints.

In other words, the patient tends to squint all the time, because the externus is too long, or the internus too short. Whenever the retinal images are so small or indistinct as not to afford sufficient stimulus for the patient to overcome this tendency, he lets his eyes go, and actually squints. But, whenever, by bringing the object close to his eyes, the retinal images become so distinct (Case *a*) or so large (Cases *b* and *c*) as to demand attention, or when the tendency to convergence is slight, so that if the images are large it is readily superable (Case *d*), the squint is overcome, and the patient has binocular fixation.

This Class C of von Graefe's comprises our case. None of his explanations, however, apply to it[1]; nor yet is it explained by another hypothesis which von Graefe puts forth later (2) to account for certain cases of the sort occurring in myopes. In these there is neither considerable anisometropia, nor inequality of sight, but simple myopia of medium degree, with marked convergence and troublesome homonymous diplopia for distance, and with binocular single vision for near. In these cases, the deviation, which usually sets in suddenly at a variable distance beyond the patient's far point and *from there out remains about the same*, is due, according to von Graefe, to preponderance and contracture of the interni produced by excessive use of the eyes at near points, or by muscular weakening due to exhausting diseases.

[1] It might be argued that it comes under the cases marked *d* above, being due to moderate increase in length of the externus or decrease in length of the internus. But if this were the case, the outward excursion of the affected eye would be limited and the inward increased (reckoning from the primary position); and again, owing to the great tension set up in the shortened internus, when the eye is turned outward, the deviation ought to increase as the eye leaves the primary position. As a matter of fact, conditions the reverse of these obtain.

This latter group of cases is interesting and important because of the troublesome diplopia to which such deviations give rise, and which may call for an operation to relieve it.[1] They develop usually in adults, particularly in myopes who have not used glasses. According to von Graefe they constitute about two per cent. of all cases of squint; but this estimate seems rather high. To the explanation that he gives for these and similar cases, there are various objections that I shall now proceed to consider.

OBJECTIONS TO VON GRAEFE'S HYPOTHESIS.

It must be apparent how forced are the explanations that von Graefe was compelled to give in order to make his cases of squint fit the theory of a universal myopathic origin.

1. *His explanations are contradictory.* For, when considering the class of cases given here under A, he argues that if the muscular conditions are such as to favor a convergent strabismus, a squint will supervene whenever the images are distinct, and an effort is made to perform fixation; while, in attempting to explain the cases given under C, he holds that, although the same muscular conditions prevail as in Class A, it is precisely when the images are indistinct and when no very strenuous efforts at fixation are made, that a squint develops.

Again, as von Graefe himself admits, the fact that in cases of Class C the deviation when one eye is screened is the same as the deviation with both eyes open militates against his hypothesis. We may, however, agree with him that the connection between the movements of the eyes is such that even when the deviation is dependent solely upon imperfection of sight in one eye, exclusion of that eye from vision will not affect the deviation. But if we accept this argument, we find ourselves compelled to abandon the diametrically opposed statement made by him with reference to the cases grouped under A, namely, that the deflection here can not be due to attempts at exclusion by one eye, inasmuch as the deviation behind the screen and the deviation in binocular vision are the same.

[1] Von Graefe (2) and Theobald (3).

2. His hypothesis, when applied to the cases of Class C, does not account for the fact that in a case like ours, and probably in most cases, the *deviation increases steadily and with perfect uniformity* from the point of equilibrium outwards, *i. e.*, as the gaze is directed successively at objects more and more remote. If the deviation were due to any of the changes that he alleges, we should expect to find it developing suddenly and showing no special tendency to increase after it had once developed.

3. If the deviation was of purely myopathic origin, it *ought to increase as the gaze is carried toward the side of the squinting eye;* for here the relatively inefficient contraction of the too long and lax externus is opposed to the excessive and increasing tension of the tightly stretched, too short internus. For the same reason, the range of excursion outward of the squinting eye should be diminished, and its excursion inward increased, very much as occurs in cases of old paresis of the externus with consecutive contracture of the internus.

Now, while in true concomitant squint, particularly in the inveterate cases, this increase in the inward and decrease in outward excursion almost invariably obtains, this is by no means the case in periodic strabismus. Indeed, as in our case, the opposite condition may prevail. This would indicate that, while there is a myopathic element in most cases of squint, it is not the only factor in producing this condition; and that when it is present it is often late in developing and presumably, therefore, secondary to another factor that is itself the primary cause of the deviation.

Is it, indeed, at all certain that the conditions which von Graefe invokes to explain the development of concomitant squint are by themselves *competent to produce it?* In other words, can a concomitant deviation be produced simply by one tendon being too short and tight, and the opposing tendon being too long? Will not such a condition rather produce a non-concomitant squint, increasing markedly in some one direction of the gaze, like that due to a paresis or contracture? The results of tenotomy would seem to indicate that this question must be answered affirmatively. For

this operation, by shifting the insertion of the tendon, reproduces in a measure the conditions that, according to von Graefe, are competent to cause a concomitant squint. Yet the changes that it sets up in the position and movements of the eye are not those of a concomitant squint, but rather those of a paresis of the muscle tenotomized. I have had repeated occasion to verify this fact when examining patients that had had complete or partial tenotomies of either the lateral or vertical muscles, and who even years afterward showed in the outskirts of the field of fixation diplopia or other evidences of deviation, increasing precisely as they would if the muscle operated upon had been rendered paretic.

It must be added that the considerations above presented apply with even greater force to the case of *periodic divergent squint*, both latent and manifest. Indeed, the inadequacy of the explanation that regards all cases of this sort as being due exclusively to insufficiency of the interni or to variations in length or to improper insertion of these muscles, has long been recognized. The very term "insufficiency of the interni" has been largely given up and replaced by the term "insufficiency of convergence," as more adequately representing the facts.

INNERVATION THEORIES OF SQUINT.

If the myopathic element is not adequate in itself to account for all the phenomena of periodic and concomitant squint, what other factor shall we invoke to explain them? The answer to this question has been found in the various neuropathic or innervation theories that have been from time to time propounded. As so far elaborated these theories explain satisfactorily two conditions, viz.:

(*a*) Convergence-excess.

(*b*) Convergence-insufficiency.

To comprehend exactly what is meant by these terms, it is necessary to recall the precise nature of the function affected in both—namely, convergence.

Convergence is a bilateral function; that is, it is a movement of adduction which is performed simultaneously in the

two eyes and which is always precisely equal in the two. Pathological evidence, moreover, demonstrates it to be governed by a special nervous mechanism, quite distinct from that which regulates the adduction of either eye when executing parallel movements with its fellow. Interference with this mechanism, therefore, will result in a bilateral deviation, *i. e.*, one equally divided between the two eyes, and one which will become marked whenever any attempt is made to converge the eyes; while, on the other hand, the ability to maintain adduction in performing associated parallel movements will be neither increased nor diminished.

This fact constitutes the essential difference between the innervational and the myopathic conceptions of the origin of squint. According to the latter, squint is an essentially unilateral phenomenon dependent upon some interference with the individual muscles of one eye. According to the innervational theory, squint is a bilateral affection which concerns a centre governing one of the combined movements of the two eyes.

From the latter point of view, **convergence-excess** is an affection in which the *interni per se* may be normal, but the convergence centre is acting to excess. The resulting symptoms are as follows (8): Esophoria or actual inward squint, particularly apparent whenever any attempt is made to converge the eyes—hence, particularly marked at middle distance and near points, and in typical cases steadily increasing as the object looked at is approximated to the eyes. Primary and secondary deviation behind the screen, equal. Near point of convergence excessively close to the eyes. Prism-divergence (so-called abduction) in moderate cases but little reduced. Prism-divergence (so-called adduction) normal and performed with ease. Lateral movements of the eyes normal in extent.

Convergence-excess comprises a very large number of the cases of periodic convergent squint, embracing those described by von Graefe in his Class B (see above, page 265) and probably also a large proportion of his Class A. It includes the ordinary form of accommodative convergent squint in young children, when it is still periodic, and very

numerous cases of heterophoria, whether accommodative or not. The convergent squint produced by the instillation of atropine is an example of it (8). As need scarcely be said, it usually passes over into a permanent squint, although when this takes place the condition no longer exhibits the characters of a pure convergence-excess, for the deviation has become equally marked for distance and near, the diverging power of the eyes has diminished, and the lateral movements of the eyes are no longer normal; abduction being increased, and adduction diminished. In fact, other innervational anomalies (divergence-insufficiency) and anomalous conditions of the muscles themselves (contracture of the interni, stretching and consequent weakness of the externi) have been superadded.

The opposite condition, or **convergence-insufficiency,** (the extreme degree of which is **convergence-paralysis**) has also been known for a long time.[1] Its characters, when uncomplicated, are: Exophoria or actual divergent squint, particularly apparent when an attempt is made to converge the eyes; hence, particularly marked at middle distance and near points, and in typical cases increasing steadily and uniformly as the object looked at is approximated to the eyes. Primary and secondary deviation behind the screen equal. Prism-convergence (so-called adduction) difficult to perform and often absolutely deficient. Prism-divergence (so-called abduction) not much in excess of normal, or often, indeed, subnormal. Near point of convergence abnormally remote from the eyes (25 or 50 centimetres, or in case of marked paresis of convergence, 1 to 4 metres). Lateral movements of eyes normal.

This anomaly of convergence is quite frequent. It includes the accommodative exophoria (or divergent squint) developing in myopes who do not wear concave glasses, and also temporarily developing in hypermetropes and presbyopes who put on convex glasses for the first time. It also comprises cases in which there is no accommodative ele-

[1] Thus by Schweigger (1881), Parinaud (1883), A. Graefe (1884), and a number of other authors. A list of these with a detailed consideration of the whole subject is given in the author's *Motor Anomalies of the Eye*, pp. 71-78.

ment. It is, in fact, the old "insufficiency of the interni" under another name. As is well known, it tends, provided the accommodative element is not eliminated, to increase progressively, so that what is at first simply an exophoria develops into a periodic divergent squint, and this itself later develops into a constant squint. But by the time that this has occurred the deviation no longer exhibits the characters of a simple convergence-insufficiency, for the deflection is now pronounced for distance as well as for near, the diverging power of the eyes is abnormally great, and the lateral movements of the eyes are no longer normal in extent; *i. e.*, there has been superadded to the original condition new anomalies of innervation (divergence-excess), and also anomalies of the muscles themselves (actual weakness of the interni and contracture of the externi).

DIVERGENCE AND ITS ANOMALIES.

The great proportion of cases of heterophoria and of periodic squint can, if examined in their incipient stages, be classified under the one or the other of the two anomalies of convergence, just described. This is not true of the more advanced cases, in which, as already stated, other factors are present and combine with the excess or insufficiency of convergence in producing the deviation. But even when examined at the outset not all cases of exophoria exhibit the characters of a convergence-insufficiency, nor do all cases of esophoria arise from a convergence-excess. For example, the case here described cannot possibly be attributed to the latter. The deviation, is marked for distance and diminishes progressively as the object of fixation is approximated to the eyes—*i. e.*, is most pronounced when no attempts at convergence are made, and becomes less and less marked in proportion as the eyes are used for converging. It cannot therefore be ascribed to an anomaly of convergence.

What other function then beside convergence can be affected in this and similar cases?

My answer to this would be that the **function affected is that of divergence,** or that by virtue of which the visual

lines when converged upon a near object are made to separate in order to sight an object more remote. Like convergence, this function is a strictly bilateral one, the movements executed being precisely equal and simultaneous in the two eyes. In their nature these movements may be regarded as consisting either in a simultaneons relaxation of both interni (*passive divergence*) or in a simultaneous contraction of both externi (*active divergence*).

Alfred Graefe (9) strongly opposes the hypothesis of an active divergence, urging against it the well-known fact that even when the externus is completely paralyzed the affected eye can still return just like the normal eye from a position of extreme convergence to the median or "*eyes-front*" position. This argument seems to be a strong one in favor of regarding the act of divergence as due not to any active contraction of the externi, but to the simple elastic pull exerted by the latter when the interni relax. Nevertheless, arguments for the opposite view are not wanting. Thus, while it is true that in paralysis of the externus the eyes can still diverge, *the paralyzed eye cannot diverge as far as the middle line.* Even in incomplete paralysis of the left externus, for instance, in which the affected eye can still move outward 1 or 2 *mm*, the left eye shows a convergence of several degrees when the right eye is directed straight ahead; and in marked paralysis of the left externus, even when entirely recent and when therefore there is no question of there being a contracture of the internus, the homonymous diplopia and the convergence as shown by the phorometer and by alternate covering persist up to 15° or 20° to the right of the median line.[1] This is surely an argument for believing that the muscular action of the externus by no means ceases at the middle line, but is carried on for some distance at least to the inner side of the latter.[2]

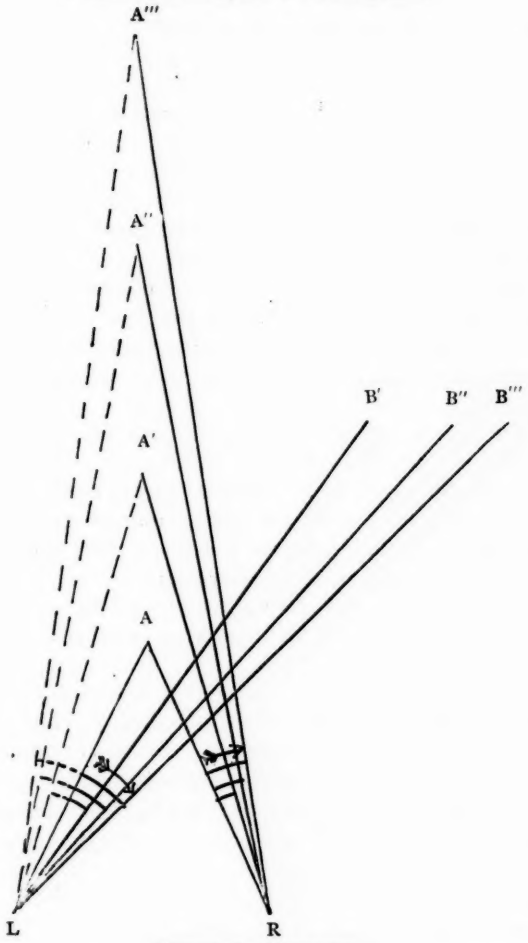
[1] Thus in a case that I saw at the Vanderbilt Clinic, in which the paralysis had developed the day before, and did not become complete until one or two days later, there was homonymous diplopia up to 20° to the left of the median line. In another case of five or six weeks' standing and also not quite complete, diplopia was present at least 15° to the inner side of the median line.

[2] The argument (*Mauthner*) that the diplopia in the "eyes-front" position in these cases is due merely to loss of tone on the part of the paralyzed muscle is simply another form of this statement, since muscular tone is nothing but residual muscular contraction.

Again the *sense of muscular strain* not infrequently experienced in the attempt to overcome prisms base in, and the ability possessed by some to produce (apparently by an active muscular contraction) a voluntary crossed diplopia of many degrees when the eyes are fixed upon distance, are indications that the function of divergence is in part at least an active process.

My own view is that *this function is probably both an active and a passive process, i. e.*, that when the eyes diverge from a position of extreme convergence, the movement is initiated by a relaxation of the interni, whereupon the eyes begin to return to the mid-position by virtue of the elastic pull exerted by the stretched externi; and that, after a large part of the double outward rotation has been effected by this mechanical means, the active contraction of the externi comes into play as a reinforcing factor and completes the divergence (through some 10°–12° of arc). This view seems fortified by two considerations: (*a*) If the eyes diverge solely in virtue of the elasticity of the externi, the movement ought to be much more rapid at its outset, when the externi are strongly stretched, than at its end; and the fact that the movement does proceed rapidly at its end would seem to indicate that in this part of the excursion the diminishing traction power of the externi considered simply as elastic cords, is reinforced by some other factor which can only be an active contraction of these muscles. (*b*) Both in paralysis of the externus and in cases of the kind recorded in this paper, while the initial part of the movement of divergence is carried on smoothly and without interruption, the terminal part is either done imperfectly or is abolished altogether, indicating that some factor that was essential for its performance has been removed by the paralysis.

But, whether this view is correct or whether, as Graefe says, divergence is a purely passive process, he and similar reasoners go too far in arguing that if divergence is not effected by an active contraction of the externi, it cannot therefore be governed by *a distinct nervous mechanism.* It surely is quite reasonable to believe that the delicate co-ordinated action required for a simultaneous and equal relax-



DIVERGENCE PARALYSIS.

The paralysis is such that both eyes naturally tend to converge so as to be directed at the point A. When the attempt is made to sight the point A′, farther off from the eyes, the eyes cannot, as they would naturally do, move simultaneously outward through the equal angles ALA′, and ARA′. The only way in which one of the eyes can sight the point A′, is for that eye to move outward while the other eye moves inward to an equal extent. This it can do, since the power to perform associated lateral movements is unimpaired. Hence as R moves out through the angle ARA′, L moves inward through the equal angle ALB′. Hence it is directed at B′ instead of A′, so that the deviation is represented by the angle A′LB′=2.ARA′. So, as the right eye turns still farther out to A″, A‴, etc., the left eye turns still farther in to B″, B‴, etc.

ation of the interni should itself demand a special nervous apparatus to preside over it. The existence of inhibitory as well as of directive nervous mechanisms is generally admitted by physiologists. And it seems scarcely conceivable that a mere letting go of the contracted interni, ungoverned by some nervous mechanism, could enable the eyes to pass smoothly, equally, and with unerring precision from one position of convergence to another and finally to parallelism.

At any rate, the question is not one to be decided upon *a priori* grounds, but by the result of clinical examination. And, if we can find a case in which this function is abolished and other functions are intact, it will go far to prove that the function itself is under the control of a distinct nervous apparatus.

What then would be *the symptoms of a case in which the function of divergence alone was abolished?*

(1) The power of either eye for moving laterally in conjunction with the other eye would be unimpaired (difference from paralysis of the externi *per se* or from a conjugate paralysis of associated lateral movements).

(2) The function of convergence would be unimpaired, but yet not excessive (difference from ordinary convergent squint).

(3) The eyes would tend to assume a position of convergence, and when converged could not diverge in the ordinary way, *i. e.*, neither eye can turn out if the other eye also turns out, so that if A represents the point to which the two eyes naturally converge, the right eye, R, cannot be directed at the more remote point, A', provided the left eye, L, turns out so as to be also so directed. But R can be directed at A' by executing an associated parallel movement with L, *i. e.*, can move out, if L at the same time moves in to an equal amount, so as to be directed to B'. The left eye now squints in through an angle $A'LB'$. As the right eye turns out more and more to look at successively remoter objects (A'', A''', etc.), the left eye keeps turning in more and more (to B'', B''', etc.), so that the angle of squint gets larger and larger ($A''LB''$ $A'''LB'''$). The deviation and consequent diplopia therefore, will increase *pari passu* as the object is

removed from the eyes (difference from ordinary convergent squint).

(4) The deviation and the diplopia will also diminish as the eyes are carried to the right and to the left (difference from paresis of the externi). This diminution will be marked and be present in tests made both for distance and near. The reason for this is that in the extreme lateral directions of the gaze the eye that is turned inward is better able to diverge from mechanical reasons, because its externus is strongly on the stretch.[1]

(5) Prism-divergence, or the ability to overcome prisms base in, should theoretically be diminished or abolished both for distance and near. For, the ability of the eyes to overcome prisms base in is simply the measure of their capacity for separating from each other (diverging), and not at all a measure of the intrinsic power lodged in their externi. And while it is true that a marked weakness of the externi is necessarily associated with an impairment of the prism-divergence, the converse is by no means true, and inability to overcome prisms base in does not necessitate the assumption that the externi *per se* are at fault, any more than deficiency of convergence necessarily means that the interni are defective. In cases of the sort here considered, the externi as such act normally, but as the power of the visual lines to move simultaneously away from each other is lost the eyes cannot diverge so as to overcome a prism base in.

Such are the symptoms that should theoretically be shown by a case of paralysis of divergence. In the case reported they are reproduced with absolute fidelity. The same is true of the cases of Uhthoff and Straub. The conclusion seems irresistible that, as these authors and Parinaud pointed out, such a paralysis is the actual causal agent in producing the deviation.

It is noted that in this case the results of examinations made at different and wide intervals of time are altogether consistent. Thus when Dr. Pischel examined the patient

[1] Also, according to Straub (7), because in the lateral positions of the gaze the maintenance of convergence is more difficult.

four years ago, the condition was evidently much the same as now, only a little more pronounced, since there was for distance a prismatic deviation of 34° corresponding to an actual convergence of about 20°. Then as now there was obviously a progressive diminution of the esophoria in proportion as the object of fixation was brought closer to the eyes, for at 40 centimetres the convergence was reduced to 11° (actual deviation = 20° prism). This is precisely what it should have been granting that it was due to a divergence-paralysis. By the same theory, the actual point of equilibrium or orthophoria then should have been at 17 centimetres from the eyes.[1] By the operation this point of equilibrium was carried out to 40 centimetres, but in its essential character the condition was unchanged, since the esophoria increased from this point out until, at distance, it amounted to 14° (prismatic), representing an actual convergence of 7° (the theory of a divergence-paralysis would call for 8½°). At present the degree of convergence for distance is 14° (actual deviation), which, according to the theory of a divergence-paralysis, would correspond to a point of equilibrium situated 24 centimetres from the eyes. As a matter of fact, this point by actual measurement lies between 17 and 22 centimetres.[1] So closely do the facts in all three observations correspond to the theory.

Apart from these instances of complete paralysis of divergence, I have had occasion, now and then, to observe cases which have seemed to me undoubtedly to be minor examples of the same anomaly, being due, that is, to a *moderate insufficiency* instead of a pronounced paralysis of divergence. In this category I should include the cases in which there is well-marked esophoria for distance, with orthophoria or even exophoria for near and with the convergence near-point at normal distance; prism-divergence (abduction) quite restricted (from 1° to 3° for distance, and comparatively small also for near points); and no limitation in the ability of the eyes to swing inward and outward in performing associated parallel movements. These cases include

[1] That is, from the base line connecting the centres of rotation of the two eyes.

some of the most difficult that I have had to treat, asthenopic symptoms being often marked, and correction of the refraction having no effect in relieving them. Nor did simple tenotomy, as a rule, help them, although it has done so in some instances (*e. g.*, one case of Uhthoff's). In fact tenotomy is not in principle the proper operation in these cases, since what we wish to effect is not to diminish the opposing power of the interni (or of convergence) which is not excessive, but to increase the diverging power *per se;* and the only adequate means that we have for doing this is to advance the externi.

According to my observation, divergence-insufficiency occurs more frequently as a condition *secondary* to convergence-excess than it does as a primary condition. It then helps to increase the deviation due to the convergence-excess, and to render it constant and concomitant.

For the sake of completeness, it remains to consider **divergence-excess,** or the state in which the eyes tend to diverge too strongly. The symptoms of this are (8): Exophoria or divergent squint more marked for distance than for near. Near point of convergence in uncomplicated cases not abnormally remote. Prism-divergence (so called abduction) excessive absolutely, and often also relatively so as compared with the degree of exophoria. Prism convergence (so called adduction) generally normal in the uncomplicated cases. Lateral movements of the eyes normal in nature and extent.

This condition occurs either as a primary affection or as an affection secondary to a convergence-insufficiency; in the latter case serving to increase the degree of divergence and to render it constant and concomitant. This same evolution of a constant and considerable deviation from a small and periodic one may also be effected in the case of a primary divergence-excess, to which a convergence-insufficiency or a true muscular anomaly (contracture of the externi, stretching and consequent weakening of the interni) has been superadded.

Cases of divergence-excess, both simple and complicated, are, as far as my experience goes, fairly frequent.

COMPLEX ORIGIN OF CONCOMITANT SQUINT. ITS ETIOLOGICAL CLASSIFICATION.

In emphasizing the importance of the anomalies of convergence and divergence in producing heterophoria and squint, I do not mean to minimize *the importance of strictly muscular anomalies* as causal factors. A certain number of cases are undoubtedly of muscular origin. Such, for instance, are many of those described by von Graefe in his Class C above given (particularly the cases in which there is actual restriction of outward movement). Another set of cases, comparatively common, are those in which a congenital over-development or under-development of the internus or externus is the original cause of the squint (muscular squint) (6). A third variety still is comprised in those cases that originate in slight degrees of paralysis of the individual muscles; the paralysis in this instance being generally associated with contracture of the antagonistic muscles.

Apart from these cases of purely myopathic origin, it must be admitted that most cases of squint that have lasted for a long time have a myopathic element, the muscles becoming stretched or contractured, so as to be no longer normal in action. In the foregoing pages, in treating of convergence and divergence anomalies, this fact has been repeatedly emphasized. And, I think, the more we look into the subject of strabismus, the more we shall find that to produce any permanent and considerable squint two or more factors must combine. Such a combination is not fortuitous, but proceeds in accordance with the law elsewhere enunciated:

"*A non-concomitant deviation usually tends to become concomitant, there being superadded to the conditions already existing another by means of which the former is generalized and rendered sensibly equal throughout the whole field of fixation*" (8).

Per contra, it may be said that the very fact of a squint being concomitant is *prima-facie* evidence that the squint is of complex origin.

In the light of these considerations, we should, I think, explain the pathogenesis of squint and heterophoria as follows:

EXOPHORIA AND DIVERGENT SQUINT MAY BE DUE TO

1. Under-action of an adductor (insufficiency in the true sense of the word) or over-action of an abductor, due to abnormalities in structure, insertion, or innervation (*muscular squint* or *exophoria*). Not very frequent by itself, but frequent as a complication.

2. Over-action of the diverging power (*divergence-excess*). Fairly common.

3. Under-action of convergence (*convergence-insufficiency*). Very frequent. May be either accommodative (in myopes) or non-accommodative.

4. One or more of the above anomalies combined (*mixed conditions*). Such a combination usually obtains in long-standing and marked cases of concomitant divergent squint.

ESOPHORIA AND CONVERGENT SQUINT MAY BE DUE TO

1. Under-action of an abductor (true insufficiency) or over-action of an adductor, due to abnormalities in structure, insertion, or innervation (*muscular squint* or *esophoria*). Not very common by itself but frequent as a complication.

2. Over-action of convergence (*convergence-excess*). Very frequent. May be either accommodative (in hypermetropes) or non-accommodative.

3. Under-action of the diverging power (*divergence-insufficiency*). Rare.

4. One or more of the above causes combined (*mixed conditions*). Such a combination usually obtains in long-standing and marked cases of concomitant convergent squint.

It is by following an etiological classification like this that we attain, in my belief, the best success in both diagnosis and treatment.

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A FURTHER CONTRIBUTION TO THE EXTRACTION OF PARTICLES OF STEEL OR IRON WITH HAAB'S LARGE ELECTRO-MAGNET.

By A. BARKAN, M.D., San Francisco.

FIVE cases of extraction of particles of iron with Haab's large electro-magnet having been previously reported in these ARCHIVES, I beg to submit seven more cases as a further contribution to this important branch of ophthalmic surgery.

CASE 6.—A chip of iron perforating corneo-scleral junction, extracted through fresh corneal incision, together with large shred of iris. Recovery.

John Marten, of Grass Valley, referred to me by Dr. V. Jameson, was hit in the left eye by what he supposed to be a fragment of rock, flying from a pick, on the 24th of February, 1898.

On examination the following day I found a sharp, perforating injury, two lines long across the cornea, well into the sclerotic. Blood filling anterior chamber. T + 1 ; V = quantitative perception of light. Projection very uncertain. Slight pain and sensitiveness to touch. Doubting the patient's statement as to the rocky nature of the foreign body, I proposed using Haab's magnet as a sideroscope, and did so with an immediate positive effect, for the patient felt a piercing characteristic pain through the eye, as if from a sharp foreign body moving to the front, although no change was visible in the eye. This being late at night, the extraction was deferred till the next morning. The following morning, finding the wound closed, I disliked to reopen it, as it lay near and in the ciliary body, and wishing to avoid a renewed traumatic lesion of this zone by the extraction of foreign body, I

made a fresh incision into the lower third of the cornea with a large lance, which was followed by copious evacuation of blood from anterior chamber. Patient's eye was placed before the magnet; then severe pain, corneal wound bulging forward towards pole of magnet. After enlarging the wound with scissors, a large metallic foreign body, weighing 1.26 *mgrm*, 5.4 x 4.7 x 2.5 *mm*, was promptly extracted, and with it an unpleasantly long piece of iris, which was clipped off smoothly; no loss of lens or vitreous; atropin, bandage, bed.

During the following ten days the eye improved fairly well under ordinary treatment; on March 4th, hemorrhage was partly absorbed, projection of light, corneal wounds healed.

March 25th.—Pericorneal injection lessened daily—very slight now. Stands light well. Lower half of cornea, along instrumental wound, slightly hazy. Anterior chamber exists only partly on account of loss of upper $\frac{2}{3}$ of iris; its lower third is preserved; partial anterior synechia, reddish reflex from background, no details. Projection fairly good. T — 0.5. No pain, hardly any soreness on touch; sees motion of hand.

April 5th.—Eye further improved.

April 15th.—Sees fingers indistinctly; abundant opacities in vitreous; fundus not visible.

June 15th.—Large corneal scar, extending to lower margin; upper $\frac{2}{3}$ clear. Lower piece of iris adherent to corneal scar. Lens in apparently normal position, and clear except joint-like opacities in anterior and posterior capsule; equator of lens visible in upper $\frac{1}{3}$ of its circumference, some bits of ciliary and iris pigment adherent to it. T normal; eyeball entirely free from inflammation, not sensitive to touch; V = counts fingers in five feet. Patient well satisfied to have his eye and a little reserve sight.

This was my first case in which extensive loss of iris ensued. Was it unavoidable? No! A clean and efficient enlargement of the sclerotical part of the wound might have opened a convenient exit for the foreign body, although some of the ciliary processes might have been dragged along, as was the iris, with a possible subsequent loss of the eyeball. In such a case the perforating point being partly in the ciliary region, it might have been advisable to follow Knapp's advice and make a fresh meridional opening between external and inferior rectus, holding the lips of the

wound apart with a platinum hook, and extract it through it. **The magnet as the "iron-finder" was quite satisfactory.**

Case 7.—Large hook-shaped piece of iron entered through cornea, entangled in and behind iris. Extraction good. Recovery.

June 2d.—William O. Bain, thirty-five years of age, machinist of Carson City, Nevada. While chipping with chisel and hammer a piece of steel, a particle struck the man's left eye. Pain was severe—had to close both eyes; presented himself, being kindly advised to do so by Dr. Hufacker, at my office the following day.

Status præsens: Slight swelling of upper lid and palpebrofrontal fold, slight photophobia and lachrymation and pericorneal injection. In centre of cornea, coinciding with vertical meridian linear scar 2″ long across the pupil; adjoining corneal area opaque. Iris shows commencing discoloration. Pupil contracted and pear-shaped; looking downward, red reflex of fundus visible, possibly also metallic lustre of foreign body; its location in the eye, uncertain; condition of lens not ascertained. No fundus details. T slightly diminished; no sensitiveness to touch; V, left = $\frac{15}{200}$. Pupil enlarged well under atropia, except in part to which probably foreign body is adherent.

In order to prevent a loss of iris as in Case 6; and in order to pave the way for the foreign body, a small iridectomy was made to the inside of the limbus; a trifling hemorrhage ensued. Large magnet *attracts*, but does not *extract*, the foreign body. Haab's magnet of no effect, the wound being too small. After a slight enlargement, the same *Haab magnet* easily removes the foreign body, which had become entangled in the iris by a very ill-shaped, hook-like end. No loss of iris, lens, or vitreous. Foreign body, 2 x 4 *mm;* weight = 6 *mgm.* Atropin, bandage, bed.

June 8th.—Wound healed; pupil well enlarged; capsule torn by foreign body; numerous radiating opacities in the lens. Fundus indistinct. V $\frac{5}{200}$.

June 9th.—V $\frac{6}{200}$; lens becomes absorbed gradually during the following two months. Eye is strong and natural-looking. Final vision = $\frac{20}{40}$ with + 9.

Case 8.—Successful removal of foreign body from vitreous; partial retinal detachment, probably before extraction.

Eugene Smith, tinsmith, Fresno, kindly sent to me by Dr. Minor, had his left eye injured while hammering piece of steel.

On examination, August 11, 1898—a day after the injury,—there was a slight pericorneal injection, little more marked toward spot situated just below outer end of horizontal meridian, within limbus, about the size of a small lentil—evidently the point of injury. Directly behind spot a slight linear defect in iris, near ciliary insertion, which transmits light. Pupil well enlarged. Lens clear. Floating opacities in vitreous. Looking downward, one long fold is seen, which appears to contain a foreign body. Disc slightly hyperæmic and indistinct; somewhat diminished; slight sensitiveness to touch. V = $\frac{1}{10}$.

Here again it was obligatory to enlarge corneal opening, for although Haab's magnet promptly attracted the foreign body into the wound—it could not get it through—but after enlargement, removal was easy and instantaneous. Foreign body weighed 2 *mgm*; size, 2 x 0.75 *mm*. The eye progressed well for a week. It was then noticed that where the foreign body first was seen, and undoubtedly caused by it, the retina had become detached. No opacity of the lens followed. Fundus became fairly clear, final central vision $\frac{2}{10}$.

CASE 9.—**Removal of foreign body from vitreous; panophthalmitis. Enucleation.**

Charles Cheeney—kindly sent to me by Dr. Hanson,—workman, twenty-two years of age, consulted me on the evening of the fifth of September. Whilst sharpening saw, the lathe which he was using broke, and a chip from the saw struck him in the left eye.

Severe pericorneal and some conjunctival secretion, beginning chemosis. Cornea quite dull; corresponding to outer half of horizontal meridian is a linear wound about 1½ lines reaching to nearly the centre of cornea. In it lie strings of grayish-white capsular and lenticular substance. Pupil somewhat enlarged after thorough atropinization. Iris dirty and discolored. *Tension* slightly increased; bulb sensitive to touch. Vision has sunk to lowest quantitative perception of light; no projection. After a slight enlargement of the wound upward, the eye was approached to the magnet: immediately ensued easy removal of the foreign body 5 *cgrm* in weight, and 5 x 3 x 1 *mm* in size. Very little vitreous lost; wound was adjusted and eye irrigated; bandage;

the patient enjoyed during the next days very careful hospital treatment.

But the symptoms of panophthalmitis which had already been in evidence when the patient first presented himself, and had even before extraction caused me to frame my prognosis very guardedly, now became more and more decided. There was a yellowish reflex from vitreous, softening and painfulness of the eye, and within six weeks from time of the injury, atrophy of the bulb developed. ENUCLEATION was advised and performed.

CASE 10.—**Removal of foreign body from vitreous; panophthalmitis. Enucleation.**

Frank Ayenard, of Fresno, was injured in the right eye by a particle of iron, while driving hoops. On January 29, 1898, the day following the injury, he presented himself with an eye foreboding no good.

A considerable swelling of lids—chemosis nearly overlapping limbus,—small perforation $1\frac{1}{2}''$ in the inner and upper quadrant of cornea, prolapsus of iris and lens substance. The latter, together with pus in anterior chamber, made further details unrecognizable. Vision = dim sensation of light; no projection; T — 1. Considerable pain, and bulb intensely sensitive to touch. It was evident that panophthalmitis had already commenced. Nevertheless, after cleaning and ENLARGING the wound, the eye gave up its destructive foreign body; weight, 7 *mgrm*; 1.5 x 2 *mm* in size; it promptly adhered to the pole of the magnet, almost immediately after closing the current. Panophthalmitis still continued; the abscess broke through the sclerotic. After the cessation of inflammatory symptoms, the eyeball commenced shrinking and remained quite sensitive to touch. ENUCLEATION was clearly indicated and performed.

CASE 11.—**Extract of foreign body from depth of eye. Recovery with very good projection but little vision.**

Mr. A. C. Richards whilst opening a box of jars on October 5, 1898, was struck in his right eye by a piece of steel which presumably flew from the head of the hatchet he was using; the effect, as expressed by patient, was, as if it was a flash of light.

Dr. Fife, of Red Bluff, referred him to me for consultation the day after the injury.

The interior half of the ocular conjunctiva slightly congested and ecchymotic; 3″ from caruncula; the impact of the foreign body noticeable near the sclerotic, but point of perforation not traceable directly. Pupil enlarged well under atropia, lens intact, vitreous filled with blood, hardly any light from the fundus, no foreign body discernible. Patient recognized motion of hand, and projection in all directions correct. No pain nor sensitiveness to touch. Normal tension. Being unable to find a perforation, and considering the promptness and correctness of projection of light, I was uncertain whether a foreign body had really penetrated, therefore, I concluded to make a TENTATIVE EXTRACTION: applying the magnet pole to corneo-sclerotic junction near point of impact. Reaction of severe pain and change of shape of pupil at that point was positive proof that a foreign body had been attracted forward, though not yet visible. A small corneal incision and snipping off of small fold of iris allowed the foreign body, 2 x 4 *mm* and 1 *cgrm* weight, to make an expeditious flight towards the magnet pole. Brilliant as was the easy and speedy removal of the foreign body, the visual results were unsatisfactory. At no time were there any reactive inflammatory symptoms. The lens remained clear, but beyond that all remained dark in the background, and with focal illumination a slight tinge of blood color was noticeable where the foreign body had penetrated into the eye. Also floating, grayish opacities, shreds of tissue, possibly torn retina. At no time was there the slightest clearing up of the interior of the eye; and at all times PROMPT PROJECTION, although only motions of the hand were dimly recognized; four months afterwards the eye had become strong to light and perfectly natural-looking. With Zeiss binocular electric lamp a white, irregular-shaped spot was clearly discernible downward, evidently a choroid rupture produced by the impact of foreign body. My prognosis, that sight would still improve, was verified, for V = $\frac{6}{60}$, with further chances of improvement.

CASE 12.—November 23, 1898, Mr. G. Blum, Elk, Mendocino Co., care Dr. L. C. Gregby, engaged in saw-mill: On December 12th, piece of steel flew from a hammer, hitting the left eye; little pain at first. Dr. Gregby, who did not think there was any piece of steel in the eye, prescribed application of eye water. The patient remained in *statu quo* for a week. He came to see me on the 23d of December. Hardly any lid secretion, some pericorneal injection, no chemosis, half a line to the inward from inner

and upper corneal quadrant, sharp, perforating wound, extending $1\frac{1}{2}''$ towards centre of cornea; cornea clear, no anterior chamber, pupil but slightly enlarged. Iris pressed forward against cornea by traumatic cataract; eyeball not sensitive to touch. $T - \frac{1}{2}$. Distinct sensation of light, good projection everywhere. A MAGNET ACTING AS SIDEROSCOPE showed instantaneous bulging forward of cornea; severe pain. Foreign body was easily removed through enlarged wound; weight, 3 *cgrm*; size, 4 x 2.5 *mm*. Traumatic cataract was gradually and slowly absorbed, with occasional glaucomatous symptoms. About three months after injury eye is free from pain and irritation. Central part of cornea somewhat bulged forward. $V = \frac{5}{200}$. Vision is likely to improve further.

REMARKS.

In 12 cases of extraction of foreign bodies:

1. Three eyes had to be removed on account of *Panophthalmitis*, which in two cases had certainly set in immediately following the injury. In those cases the magnet did good work, but against impossible odds.

2. Eight eyeballs have been saved, 4 recovered very good vision, 4 partially useful vision; one man died of delirium tremens.

3. I have found it advisable to always enlarge the wound previous to extraction in order to facilitate the exit of foreign body.

4. A meridional sclerotical section might be advantageously tried in cases of perforation of foreign body into the vitreous.

5. Haab's magnet does all that the hand magnet will do; it does more (illustrated in Case 6), but must be used guardedly; compared with the latter it avoids destruction of vitreous and diminishes danger of infection.

6. IT IS A GOOD AND SAFE SIDEROSCOPE.

BULLET WOUND THROUGH HEAD WITH LOSS OF RIGHT EYE AND VISION MUCH IMPAIRED IN LEFT.

By Dr. J. H. DELANY,

Oculist and Aurist to St. Vincent's Hospital, Erie, Pa.

February 16, 1899.—J. C. was shot in the head; the ball (32 cal.) entered the right temporal bone just above the zygoma and about one eighth of an inch posterior to its central portion, passing through into the orbit, severing the optic nerve of right eye, passing through body of sphenoid down under the left eye, making its exit just below the zygoma and one quarter of an inch anterior to its centre. There are a few interesting features in this case which I will explain. The bullet in its passage divided the optic nerve completely, close to the optic foramen, causing the eye to protrude, but without rupturing the eyeball. The eye was enucleated and a very careful examination made as to the condition of the orbit, but no fracture or splintering of bone could be detected—in other words, the orbit appeared normal in every respect. The socket was packed with iodoform gauze and a pressure bandage applied. I did not remove this dressing until the third day as the patient felt comfortable and temperature never rose above 100° at any time. The left eye from external appearances looked normal, except some conjunctivitis and œdema of lids, although the patient stated at the time that he could see very little out of it. The eye was washed in a solution of boric acid three or four times a day and a shade applied until an ophthalmoscopic examination could be made, for the patient at this time was very weak from loss of blood and I did not deem it advisable to make the examination at this visit.

February 19th.—Third day after enucleation, removed dressings and washed wound and orbit in solution bichloride 1 to 5000,

as there was a slight discharge. There was also much infiltration of orbital tissues which we generally get in injuries of orbit. Same dressings used and more pressure made with bandage. I also made an ophthalmoscopic examination of left eye at this visit, and found a large subretinal hemorrhage covering about three quarters of the nerve and extending over the macula. Nothing could be made out as to the condition of retina or choroid at this examination, except at two places the blood-clot appeared darker and thicker, the larger spot being just below the nerve and to the temporal side, the other was just under the macula in the form of a straight line. These two spots looked very suspicious, but, as stated above, nothing definite could be obtained. Vision at this examination was as follows: Central vision, counts fingers about eighteen inches; to the temporal side and below the median line, counts fingers about three feet. Vision entirely destroyed above the median line. Iodides were ordered and the patient kept quiet in bed.

February 20th.—Dressed wound and orbit. A slight discharge continues, with orbital infiltration increasing so that the lids are now several times their normal size. Pressure bandage continued. I also made an ophthalmoscopic examination of left eye at this visit and found blood clot rapidly absorbing, so that I could now see the two dark spots mentioned in yesterday's examination plainer, yet could not state just what the condition was. Vision somewhat improved to temporal side, central vision about the same.

February 21st. Dressed wound and orbit. Very little discharge. Orbital infiltration decreasing. Removed two pieces of loose bone from temporal bone on right side, also two pieces through the nose, which, I think, came from the sphenoid bone. In syringing wound the solution would pass out of orbit and nose. Same dressings as on previous visits. Examination of left eye. Could now detect two ruptures of choroid; the larger one just below and to the temporal side of the optic nerve, the other just under the macula in the form of a straight line. These were the two suspicious-looking spots mentioned in my first examination, but, as stated then, nothing definite could be made out owing to the large blood-clot. At this examination I also noticed a large white space surrounding the macula: the veins much dilated and arteries contracted, showing that the circulation has been much impaired. No change in vision.

I did not see the patient again until February 24th, when an examination was made. No discharge from wound or orbit. A small sterilized probe was passed into wound on right side; it entered the orbit with the slightest touch and passed over to the septum of nose. Examination through the nose with the forehead mirror showed that the end of the probe could be plainly seen far above the superior turbinated bone, the septum having been driven to the left by the force of the bullet. The wound in the temple on the right side was kept open by a tent of iodoform gauze so that granulation might start from below. No change in left eye at this examination, except that blood-clot was nearly all absorbed.

February 26th.—Patient came to my office, when a careful examination was made. The wound on right side showed healthy granulations; no discharge, but there was much retraction of lids of right eye. Left eye counts fingers at two feet; to the temporal side, below the median line, counts fingers at five feet; above the median line, vision destroyed. The perimeter showed the field to be as follows: Field destroyed above the median line; below the median line and to the nasal side, 30°; to the temporal side and below, normal. Just to the nasal side of the optic nerve was a large scotoma. The nerve looked very pale, and I feared atrophy was setting in, so ordered strychnia gr. $\frac{1}{30}$ three times a day.

Patient was not seen again until March 10th, when the wound was entirely healed, with much retraction of lids, so that the patient will be unable to wear an artificial eye. No change whatever in the condition of left eye; by looking down and to the temporal side he is able to see his way through the streets without assistance. Everything connected with the eye quiet at this time, the veins remain dilated, arteries contracted. The nerve still retains that anæmic appearance but no worse than it was February 26th, but as it is a recent case atrophy may still take place.

The most interesting features in this case, to me, are the following. The bullet passed through the bone into the right orbit about its centre (as the probe proved), but did not rupture the eyeball. The only explanation I can offer for this is as follows: the bullet was deflected by the eyeball down in the direction of least resistance, viz., the cushion of fat in which the eye is embedded, and then across, just in

front of the optic foramen; but a bullet going at such a rapid rate, a person would think that it would pass straight through the eyeball, but such was not the case.

Another point of interest is as follows. A very careful examination was made as to the condition of the orbit after enucleation, but no hole, fracture, or splintering of bone could be detected, but, as stated above, the bullet entered the orbit about its middle on temporal side. My explanation for not being able to detect the bullet hole in the orbit after enucleation is, that the orbital bones are very thin in the living subject and are more in the form of a strong membrane, so that when the bullet passed through these bones fell together again and closed the opening.

THE USE OF THE EXTRACT OF THE SUPRARENAL CAPSULE IN DISEASES OF THE EYE.

By W. H. BATES, M.D., New York.

FIVE years ago, while experimenting to determine the therapeutic effect on the eye of the active principles of the ductless glands, I discovered the valuable property of the aqueous extract of the suprarenal capsule. Two years later I read my first paper on this subject before this section of the Academy.[1] Since that time the suprarenal extract has been extensively used both in this country and in Europe, and my claims for it have been confirmed wherever it has been intelligently employed.

It is a powerful astringent. When a drop of the aqueous solution is instilled into an inflamed eye, the conjunctiva of the globe and lids is whitened in an average case in one minute. The effect is very decided. In mild cases the whitening may be more than normal. In severe cases of congestion or inflammation the eye is whitened to an appreciable degree. No case has been found in which the extract did not act. The astringent effect is increased by repeated instillations or by the use of a stronger solution. The cause of the redness has no effect on the result. An eye irritated by a foreign body on the cornea can be promptly whitened by the extract, as well as eyes inflamed from local infection or as a complication of general disease. The effect is usually temporary. In most cases after half an hour the eye looks as it did before the extract was used. The extract is not irritating. It generally produces a cooling sensation in the eye. It has no effect on the nervous system directly. The

[1] *N. Y. Medical Journal*, May 16, 1896.

pupil is not contracted or dilated by it, and the accommodation is never affected. The extract has no anæsthetic property, and when pain was relieved by its use the benefit came from the lessened congestion produced by the extract. A tolerance is never acquired; one patient used the extract daily for six months, and the eye was whitened temporarily by it at the end of that time as in the beginning. No secondary effect was observed; inflamed eyes do not have an increase of congestion or pain after the effect of the extract has worn off. The suprarenal extract does not cause desquamation of the corneal epithelium in normal or inflamed eyes in my experience. Ten experiments were undertaken to determine this with normal eyes in which the suprarenal extract was instilled at short intervals for three hours and no desquamation followed. Five cases with purulent keratitis were subjected to the action of the extract at frequent intervals for one hour without desquamation. A 30 per cent. solution did not cause desquamation of the corneal epithelium in a normal eye after one hour's use. The hypodermic administration of the extract is very painful.

It was observed that the instillation of the suprarenal extract into the eye had an effect on the general circulation as well. Therefore it was necessary to learn what pathological conditions contraindicated the use of the extract. An extensive series of observations showed that the extract might be instilled with safety in the eye in advanced stages of organic heart disease, pneumonia, nephritis, and in other serious conditions. Incidentally it was discovered to be an ideal heart tonic. I was the first to publish its use as a heart stimulant in various forms of heart disease (*Medical Record*, October 8, 1898).

Preparation of the aqueous solution.—Five grains of the dried and pulverized gland of the sheep are mixed with one drachm of water. The mixture stands five minutes and is then filtered. The filtrate contains about 1 per cent. of the extract. A solution of 33 per cent. can be obtained. It may be sterilized by heat or preserved at a low temperature. It cannot be mixed with antiseptics or with any other substances without impairing its astringent property in the

eye. It is best to prepare it freshly when needed. The dried and pulverized suprarenal capsule keeps indefinitely. It can be obtained from Armour & Co., Chicago, Ill.

The solution when properly prepared is of a light brown color. One drop in a normal eye should whiten the caruncle more than normal in less than one minute. It should be emphasized that no other substance can be mixed with it without impairing its astringent property in the eye. I have made many experiments with preservatives. The list includes carbolic acid, glycerine, bichloride of mercury, alcohol, ether, chloroform, naphthaline, trikresol, camphor, boric acid, nitrate of silver, holocaine, cocaine, sodic chloride, and sulphate of iron. All were unsatisfactory either because they precipitated the active principle, or were too irritating when used in the eye, or else were inefficient.

Chemical properties.—The extract is very soluble in water, insoluble in strong alcohol, chloroform, and ether. When dried it is of a light yellow color. The aqueous solution gives with ferric chloride an emerald-green color, and with solutions of iodine a beautiful rose-carmine tint. This fact was first published by Vulpian in 1856 (*Compt. Rend.*, xliii., 663–665). The extract is a strong reducing agent. Abel and Crawford (*Johns Hopkins Bulletin*, No. 76, July, 1897) find that the active principle is a basic substance which they have obtained in the form of a sulphate and hydrochlorate.

Physiological properties.—Oliver and Schäfer (*J. Phys.*, 1895) find that the extract increases the tone of all muscular tissue by direct action. When the suprarenal capsule is removed, the heart and muscular system generally are weakened, with great want of tone in the vascular system. The intravenous injection of the extract obtained from .01 gramme of the fresh gland raised the blood pressure of a dog twice its original height. With digitalis and ergot in larger doses they obtained very insignificant results. The extract contracts the arterioles in the frog after destruction of the central nervous system; from this and other experiments they conclude that it does not act upon the vasomotor centre. Their paper contains an extensive bibliography.

Therapy.—In the treatment of diseases of the eye it is important to remember that the extract is an astringent and nothing else.

CONJUNCTIVITIS.

CASE 1.—A physician, aged seventy, had suffered for two weeks with acute catarrhal conjunctivitis. One drop of the aqueous solution of the extract was instilled in each eye. The reddened ocular and palpebral conjunctiva was whitened in a few minutes, and the disagreeable subjective symptoms disappeared at once. The relief was permanent.

The extract has cured forty other cases of acute catarrhal conjunctivitis with other treatment after one or two instillations. In chronic conjunctivitis the relief is temporary. Purulent conjunctivitis and trachoma were benefited, but never cured by the extract alone.

KERATITIS.

CASE 2.—A boy, aged ten, with interstitial keratitis, received local and general treatment six months without benefit. The cornea was covered with blood-vessels. A few drops of the extract caused all the corneal vessels to disappear. The keratitis was cured in two weeks with the extract and other treatment combined. No relapse occurred after six months.

It was always necessary to use other remedies with the extract in the treatment of keratitis. In suppuration of the cornea the extract did not prevent the formation of pus because it is not an antiseptic.

IRITIS.

CASE 3. A man aged forty suffered from rheumatic iritis at irregular intervals, the attacks continuing three months usually before recovery.

In his last attack the eye was very red and painful. Atropine and cocaine used frequently for half an hour had no apparent effect. A few drops of the extract whitened the eye to almost the normal and the pain disappeared. In ten minutes more the pupil had dilated *ad max.* Two days later the eye was normal and remained so.

The extract is not curative in iritis. It only relieves congestion, and has no beneficial effect on the constitutional cause. In chronic iritis the effect is but temporary. A valuable property of the suprarenal extract is that it materially assists atropine in dilating the pupil by relieving congestion of the iris.

ACUTE DACRYO-CYSTITIS.

CASE 4. A woman aged fifty-two had had a watery eye for years. An abscess formed in the sac, with swelling and redness of the overlying skin and of the eyelids. Pus exuded from the lower punctum on pressure over the sac. The patient suffered agonizing pain, which was not relieved by syringing cocaine into the sac through the punctum. The sac was washed with a weak solution of the suprarenal extract, and the pus was removed by pressing it out of the punctum and down the nasal duct into the nose. The swelling, redness, and pain were entirely relieved, and the parts looked normal in half an hour. The relief was permanent. I believe that without the extract this case would have required surgical treatment.

In subacute and chronic cases of purulent inflammation of the sac, the extract is rarely curative, because an organic stricture of the nasal duct is present.

The extract also has no effect on necrosed bone.

Lachrymal strictures.—The astringent property of the extract is invaluable in making the differential diagnosis between strictures of the nasal duct, due to swelling or inflammation of its mucous membrane, and impervious organic strictures. In the former, the extract finds its way into the nose when syringed into the sac through the punctum, and the stricture can be cured by treatment without operation; in the latter, an impervious stricture is usually present when the extract fails to find its way into the nose after repeated trials.

LACHRYMAL OPERATIONS.

CASE 5. A woman aged forty-two had been operated upon for lachrymal stricture. Cocaine was used alone, the operation was exceedingly painful, and the hemorrhage was copious. A relapse occurred. A second operation was done, using the extract and

cocaine alternately during the operation. The patient was not worried. She said she felt no pain whatsoever, and not one drop of blood was seen. No relapse followed. In a number of other cases with slight hemorrhage from the operation, a relapse was the rule, unless the patient received after-treatment.

Tenotomies and advancements of the eye muscles.—Short operations on normal eyes are usually done painlessly with cocaine alone. But in nervous people, inflamed eyes, eyes congested after recent operations, prolonged operations, and in bloody operations cocaine does not usually secure complete anæsthesia. In these cases the extract is of great service.

Case 6. A man aged thirty was so nervous that he promptly fainted when he was told that a tenotomy was indicated on his eye. Cocaine 2 per cent. was instilled thirty minutes without dilating the pupil or producing anæsthesia. The patient was worried. I shall never forget the effect of the extract on this patient. His whole body seemed to relax. The anxious expression of his face disappeared. He smiled and told me that he was all right now. The pupil began to dilate. Cocaine now produced anæsthesia, and the operation was completed satisfactorily. In a number of other cases, hysterical women and in children, it was only possible to operate painlessly after the extract was used.

Case 7. A man, aged twenty-eight, with chronic conjunctivitis had strabismus. Cocaine increased the redness of the ocular conjunctiva, and did not produce anæsthesia in twenty minutes. The extract whitened the eye more than normal. Cocaine now anæsthetized in a few minutes. A painless and nearly bloodless tenotomy was then done.

Case 8.—An advancement of the external rectus was made recently. The effect was too great. Ten days afterwards an attempt was made to lessen it by a tenotomy. The eye was still red, and cocaine did not produce anæsthesia until after the extract was used.

Case 9.—A woman aged fifty was operated upon for advancement of the internal rectus. Cocaine was used alone. Pain and hemorrhage were severe, secondary hemorrhage also followed, and the reaction after the operation was considerable. The result was not satisfactory, and one month later a second advancement was done on the same muscle. At this time, the extract was used

with cocaine. The operation was done without pain, and with slight hemorrhage. No secondary hemorrhage occurred as after the first operation. No reaction followed, and the eye healed without pain. The result was all that could have been desired.

In a number of cases the absence of reaction after operations on the eye muscles when the extract was used was noted.

Cataract extraction.—Usually cocaine is perfectly satisfactory in performing a painless operation. Exceptions do occur. In a recent case after the section was completed, the patient complained that the eye was tender. It was impossible to touch the cornea without pain. Cocaine, four per cent., was instilled frequently for fifteen minutes without producing anæsthesia. The patient complained that the drops hurt. The patient had a bad heart and ether was objectionable. A few drops of the suprarenal extract were instilled. The patient's nerve seemed to return. Cocaine now produced anæsthesia, and the operation was finished in a few minutes. I feel certain that I could not have extracted the lens and obtained good vision in this case without the extract.

Iridectomy for glaucoma.—The extract is valuable in the inflammatory cases in which ether is usually necessary to secure anæsthesia. The suprarenal extract lessens the congestion so that cocaine can act. In one case cocaine was instilled for half an hour without producing anæsthesia. A drop of suprarenal extract whitened the eye. The cocaine anæsthetized the eye immediately, and a painless iridectomy was completed in five minutes from the time the extract was instilled. Darier used it at the suggestion of L. Dor, and reported four cases in which the suprarenal extract whitened the eye and lessened the congestion sufficiently for cocaine to produce complete anæsthesia.

Before closing this short paper I would like to **refer briefly to the use of the extract in the nose and elsewhere,** especially as the results confirm its use in the eye. Mullen[1] has reported painless and bloodless major operations on the

[1] Mullen, *The American Journal of Ophthalmology*, Aug., 1898.

nasal septum with cocaine and the extract. The ossicles and drum membrane have been removed without pain or hemorrhage with the use of the extract (and cocaine). Swain[1] finds that it reduces enlarged tonsils, besides whitening the nasal mucous membrane. Urethral strictures have been opened in the same manner as lachrymal strictures were benefited. Its ability to reduce granulations in the eye and hasten repair has been observed also in the treatment of ulcers of the leg. I am indebted to Dr. R. W. Wilcox, of New York, for the history of the following case in which the extract showed in a convincing way its ability to secure prompt healing by its astringent property.

A man aged sixty-five was treated three months for a carbuncle without much benefit. The open wound had increased to two inches long, by one inch wide. The granulations bulged beyond the level of the skin three eighths of an inch, and were fiery red. The suprarenal extract was applied to the wound. In ten minutes the granulations were white, and had contracted below the level of the skin. Xeroform (bismuth tribromophenylate) was used as an antiseptic. This treatment was repeated every other day. In eight days the wound was healed.

In conclusion it can be affirmed that the suprarenal extract is an astringent of great value. During the five years in which I have used it no disagreeable effects followed its instillation in the eye. Finally I can but repeat what I said three years ago, that within the limits of its sphere of activity no other substance can take its place.

[1] Swain, *N. Y. Med. Journal*, Dec. 24, 1898.

CONCERNING THE BACTERIOLOGY OF ACUTE CATARRHAL CONJUNCTIVITIS.*

By C. A. VEASEY, A.M., M.D., of Philadelphia.

THE first bacteriological examinations of the secretions found in the different varieties of conjunctivitis were, I believe, made by Koch[1] in 1883. Occasionally he found the gonococcus in the discharge of Egyptian ophthalmia and in other cases a small, slender bacillus, closely resembling that found in mouse septicæmia. In 1885, Weeks,[2] in making a study of the discharges of acute catarrhal conjunctivitis of epidemic character, which vulgarly bore the name of "pink eye," discovered that this bacillus was always present in conjunction with another that was club-shaped. These he succeeded in cultivating; and though at that time he was unable to get a pure growth of the slender bacillus he did obtain pure growths of the club-shaped bacillus. Inoculations of a healthy conjunctiva with the latter gave negative results, but inoculations with the mixed growth gave positive results. He therefore concluded that the slender rod-like bacillus was the etiological factor in acute catarrhal conjunctivitis of epidemic character.

The work of Weeks was possibly corroborated by Kartulis[3] in Egypt, and certainly by Morax and Beach[4] in Paris, and still more recently by Weichselbaum and Muller.[5]

* Read in abstract before the meeting of the Section on Ophthalmology of the American Medical Association in June, 1899.

[1] Koch, *Wiener med. Wochenschrift*, No. 52, 1883, vol. xxxiii., p. 1550.

[2] Weeks, Archives of Ophthalmology, 1886, vol. xv., p. 441.

[3] Kartulis, *Centralblatt f. Bacteriology u. Parasitenkunde*, 1887, No. 10, vol. i., p. 289.

[4] Morax and Beach, Archives of Ophthalmology, January, 1896, vol. xxv., p. 54.

[5] Weichselbaum and Müller, *Archiv für Ophthalmologie*, vol. xlvii., 1, p. 108.

In 1894, Morax[1] described four cases of conjunctivitis in children, in the conjunctival discharges of which was found the pneumococcus of Fraenkel. In each case only one eye was affected and there was a thin membrane covering the tarsal conjunctiva, which led the author to believe that the pneumococcus produced a membranous conjunctivitis. In this belief he has not been generally supported, but that it does sometimes occur I can bear testimony. I have seen it in a marked degree in two cases following attacks of measles in which, until the bacteriological examinations were made, there was some doubt as to whether the disease was diphtheric, and again in a less marked degree in a third case occurring during an epidemic of the so-called "pink eye." In all three the pneumococcus was found in a pure state.

The next to direct attention to the pneumococcus as a cause of conjunctivitis was Gasperini,[2] and it is really he who was the first to ascribe to the disease its importance as a contagious affection attacking both eyes and occurring in adults as well as in children.

Parinaud[3] records a few cases of mild conjunctivitis occurring in the new-born, accompanied by slight swelling of the lids and muco-purulent discharge, but in whom marked obstruction of the lachrymal canals suggested the possibility of the latter having been the points of origin.

Axenfeld[4] observed two epidemics of muco-purulent conjunctivitis occurring in school children produced by the pneumococcus. He inoculated the normal conjunctiva and the nasal mucous membrane with the discharge from the affected eye with negative results, and argues that it is possible that some disease of the lachrymal duct or hyperæmia of the conjunctiva must first exist to make the inoculations effective.

In 1896, Gifford[5] published his results. In his neighbor-

[1] Morax, *Thèse de Paris*, 1894.
[2] Gasperini, *Annali di Ottalmologia*, vol. xxiii., Fasc. 6, xxiv., supplement, xxv., Fasc. 1.
[3] Parinaud, *Annales d'Oculist.*, vol. cxiii., p. 780.
[4] Axenfeld, *Transactions Ophthalmological Society*, Heidelberg, 1896.
[5] Gifford, ARCHIVES OF OPHTHALMOLOGY, July, 1896, vol. xxv., 3, p. 314.

hood, that is for Omaha and vicinity, in the study of all the cases of acute catarrhal conjunctivitis of epidemic character coming under his observation in eight years, he found in almost every case (36 out of 40) not the Weeks bacillus but the diplococcus of Fraenkel. Moreover, he carried the disease from eye to eye by means of the discharge and always found in the discharge from the inoculated eye the same germ; and again, with pure anaërobic growths of the third generation he inoculated the healthy conjunctiva of man with positive results. It would seem, therefore, if Gifford's work is corroborated, that the conjunctivitis produced by the pneumococcus of Fraenkel is entitled to the description "contagious" as well as that produced by the Weeks bacillus.

Junius,[1] of Koenigsberg, in the bacteriological examinations of 60 cases of acute catarrhal conjunctivitis of epidemic character found the pneumococcus in 49. In 31 of these examinations it was found in a pure state, and in 18 it was found mixed either with the staphylococcus or the so-called xerosis bacillus.

Kyle[2] reports that the majority of cases of conjunctivitis seen by him in Matanzas during the Spanish-American war were produced by the pneumococcus.

Since the publication of Gifford's observations in 1896, bacteriological examinations have been made in a large number of cases of acute catarrhal conjunctivitis of epidemic character that the writer has seen in dispensary and private practice. A portion of these observations were recorded in a paper, by G. E. de Schweinitz and myself, read before the Section on Ophthalmology of the College of Physicians of Philadelphia, in December, 1898. Most of the cases were studied in the dispensary of the Jefferson Medical College Hospital, and I am greatly indebted to Dr. R. C. Rosenberger, the bacteriologist to the hospital, for making a large number of the examinations.

In the short time at my disposal to-day, I can only record briefly my observations as a whole without going into the

[1] Junius, *Zeitschrift f. Augenheilkunde*, January, 1899.
[2] Kyle, *Columbus Medical Journal*, April, 1899.

detail of the work. Altogether the conjunctival discharges from 64 cases of acute catarrhal conjunctivitis have been examined. Of these 6 contained the micrococcus pyogenes albus (probably the same as the staphylococcus epidermidis albus of Welch), in a pure state, 2 contained a mixed growth of the micrococcus pyogenes albus and the micrococcus pyogenes aureus, 3 contained the bacillus of Weeks accompanied by the club-shaped bacillus, and in another what was supposed to be the bacillus of Weeks was found in the cover-glass preparation but the cultures gave pure growths of the pneumococcus, and 52 contained the pneumococcus of Fraenkel. In 10 of these the pneumococci were mixed with the staphylococci or with some micro-organism, the exact character of which could not be determined, but the former were always present in immensely greater numbers. Those cases in which the micrococcus pyogenes albus or aureus was found were of a very mild character, consisting of moderate redness of the palpebral conjunctiva with slight agglutination of the lids, generally confined to one eye, and with no history of spreading to other members of the household.

The cases in which the bacillus of Weeks was found were under treatment simultaneously with other cases due to the pneumococcus, and it was impossible, though careful studies were made for the purpose, to differentiate between them clinically. It was only through the bacteriological examination that the true nature of each was revealed.

The oldest patient in my list of pneumococcus conjunctivitis was sixty-two years, the youngest five months. In two of the cases the disease was complicated by superficial ulceration of the cornea. I have seen also a number of cases of severe ulcers of the cornea from the scrapings of which the pneumococcus was obtained, but without the characteristic symptoms of contagious conjunctivitis, and to instances like these I do not refer.

The symptomatology of acute contagious conjunctivitis and of pneumococcus conjunctivitis is so familiar to us all that I shall not take the time to describe it in the present paper. One point, however, in which my experience has

been somewhat different from that of Gasperini and Gifford, is that in the pneumococcus conjunctivitis the second eye affected is, as a rule, the more severely inflamed, unless the patient is seen in the very beginning of the disease and the treatment employed for both eyes, even though the second eye be not yet, to all appearances, involved.

A number of clinical observations made during my study of the disease impressed me more than ever of its contagious character before any attempt at inoculations had been made. The following is an example:

In the neighborhood of the Jefferson Medical College six students were lodging in one house. One of these presented himself to me for the treatment of a typical contagious conjunctivitis of a very severe character. In the course of ten days three of the other students of the house presented themselves, similarly affected. With a view to ascertaining why four should have the affection and six escape it, inquiry was made and it was discovered that the four who were affected were accustomed to congregate in each other's rooms, both during the day and evening, whenever at work, and that during the period of the progress of the disease none of them had frequented the rooms of the other six students, or *vice versa*. As the four who had conjunctivitis were in the habit of using indiscriminately the towels and wash bowls of the room they chanced to be in, it was presumed that the inoculations were made in this manner.

To ascertain the actual contagiousness of the affection the following experiments were made:

1. Miss A. P., aged twenty-one years, presented herself for the treatment of a very severe conjunctivitis, presumed to have been due to the pneumococcus; and this was afterward proven to be true, both by cover-glass preparations and cultures. A small amount of the discharge from her conjunctiva was at once transferred with a sterile platinum loop to the healthy conjunctiva of M. A., a male, aged thirty-six years. On the following day there was a sensation of heat and fulness of the eye, which in twenty-four hours more presented the appearance of pneumococcus conjunctivitis, and from the discharge of which were obtained cover-glass preparations and pure cultures of the pneumococcus. The affection was not permitted to progress any farther but was checked by the use of the zinc lotion.

2. An anaërobic culture of the second generation was made on serum agar, according to the method of Fraenkel, from the conjunctival discharge of the first patient, Miss A. P., and while this was still young and the solid growth scanty, two drops of the condensation water were dropped on the healthy conjunctiva of A. M. aged twenty-five years, with a sterilized pipette. In twenty-four hours the eye was somewhat red and there was a moderate discharge, but the typical symptoms were not found until the following day and therefore appeared sometime between twenty-four and forty-eight hours after the inoculation had been made. At this time the symptoms were marked and both cover-glass preparations and cultures gave only the pneumococcus in a pure state. On the third day the discharge was so profuse and the eye so uncomfortable that the zinc lotion was prescribed and the patient rapidly recovered from the attack.

3. A second generation was obtained from a twenty-two-hour-old serum agar growth, primarily taken from a very severe case. As soon as the growths on the solid had begun to appear, a patch of them, together with a thin portion of the underlying solid medium upon which they were growing, were picked up with a sterile pipette of large calibre and transferred to the healthy conjunctival cul-de-sac of A. C., a male, aged twenty-three years. On the following day the eye was not different from normal and the patient had experienced no discomfort whatever. On the morning of the second day there had been slight agglutination of the lids, and a very moderate discharge, but on the third, and much more marked on the fourth day, the lids were so swollen and adherent that they could not be separated until applications of warm water had been made ; and there was a profuse discharge collecting in rolls, and numerous small well spread-out subconjunctival hemorrhages beneath the shiny red ocular conjunctiva. The examination of this discharge, both in cover-glass preparations and in cultures, showed only the pneumococci in a pure state.

Since the above positive result was obtained I have made an unsuccessful effort to repeat it ; and as I never obtained any reaction in two inoculations with the condensation water of a serum agar culture, I wondered, naturally, if the introduction of the small amount of serum agar with the germs had any effect in the result. Several attempts, how-

ever, to provoke irritation or inflammation with sterile serum agar have given me negative results, so I am obliged to believe that in itself it had no more to do with the production of the conjunctivitis than did the condensation water of the anaërobic growth in the former experiment. Why the conjunctiva in this case was so favorable to the growth of the micro-organism it is impossible to say as it seemed, to all appearances, to be normal in every respect.

To recapitulate, it would seem:

1. That for Philadelphia and immediate vicinity by far the most frequent cause of acute catarrhal conjunctivitis is the pneumococcus of Fraenkel.

2. That occasionally it is produced by the Koch-Weeks bacillus, and that the clinical manifestations of both are so similar in severe cases that it is practically impossible to distinguish between them without a bacteriological examination.

3. That the experiments of Gifford showing the contagious character of the disease and its reproduction with anaërobic cultures have been fully corroborated.

4. That it has also been reproduced by the writer with a pure aërobic culture.

5. That it is a disease met with more frequently in young adults, but apparently may occur at any age.

ON THE INJECTION OF A WEAK STERILE SALT SOLUTION INTO COLLAPSED EYES.[1]

By HERMAN KNAPP.

AT the March meeting, 1898, of the Section on Ophthalmology and Otology of the New York Academy of Medicine, I mentioned[2] the case of "a patient ninety-one years of age, whose cornea had profoundly collapsed after a smooth extraction of cataract. The next day, the anterior chamber was restored, but its contents were muddy, and the iris was swollen. I opened the wound and let the aqueous out daily for ten days. The cornea remained intact, the anterior chamber refilled, the aqueous was clear, but the pupil closed." The vitreous had become turbid, and the patient was discharged with perception of light (which later was lost, and the eyeball shrank). This was the only case of infection in 110 extractions during the winter. I added: "*If I should have another case in a feeble, very old patient, where the cornea deeply collapses, I would inject a warm, sterile salt solution into the anterior chamber to prevent the eye, when refilling, from sucking in secretion from the conjunctival sac.*" Dr. Gifford, who was present at the meeting, "thought that this suggestion was a very excellent one" (*l. c.*, p. 365).

Thus far I have only once (Case 3, below) had occasion to introduce a sterile saline solution into the eye from mere collapse of the cornea, knowing that in ordinary cases of the

[1] Communicated, with presentation of a patient, at the meeting of the Section on Ophthalmology and Otology at the New York Academy of Medicine, May 16, 1899.

[2] See the report of the Secretary in these ARCHIVES, vol. xxvii., p. 364, 1898.

kind the anterior chamber refills quickly, and the lips of the wound apply correctly. That the procedure is harmless and undoubtedly useful, not only in extraordinary cases of sinking in of the cornea, but also in cases of collapse of the whole eyeball, is attested by three cases, which I beg to detail.

CASE I.—**Substitution of cholesterinic aqueous and vitreous humors by physiological salt solution.**

This refers to a man whom I presented to this Society at its March session, 1899. His eye, from which I had, ten years ago, "successfully" extracted a particle of steel with the small magnet through an opening in the outer-lower part of the sclerotic, had preserved its shape, but gradually lost its sight, was filled with cholesterine crystals to such a degree as I had never seen before. Cholesterine crystals were deposited at the bottom of the anterior chamber like an hypopyon of 3 or 4 *mm* in height, and more of them were swimming in the whole anterior chamber, and in and behind the pupil, so that the patient wanted to have the eye removed, because, he said, the eye attracted so much attention that employers would not give him a position. I asked whether he would let me try to remove the glittering disfigurement. He consented. I made an incision into the outer-lower part of the cornea, 3 *mm* from the margin, let the aqueous out, scraped the cholesterine sediment out, and injected five or six small syringefuls (E. Meyer's lachrymal syringe) into the anterior chamber, and through the pupil into the vitreous cavity, until the water flowed out free from crystals. The eyeball did not collapse, for the aqueous and vitreous humors had been replaced by a warm, sterile, 7 : 1000 sodicchloride solution. The anterior chamber was restored, the iris in position, and the pupil black, round, and central. The eye was bandaged, and the patient put to bed. There was episcleral redness for about a week, when the patient was discharged. He returned in a few weeks. The eye was in a pretty good condition ; it showed traces of cholesterine again, but in size, appearance, and motion it was no longer conspicuous. Yet the patient wanted to have it removed. He said it hurt him in the same way as it had hurt him a long time before the operation. As there was a slightly indrawn scar at the lower-outer part of the sclerotic—from the magnet operation,—and as I was convinced that the formation of cholesterine would return, I yielded to his request and removed the eye.

Though the substitution of the liquefied and degenerated vitreous by a saline solution did not benefit this patient, it showed that the procedure could be done with impunity, and it was only a few weeks later that I had an opportunity to try it on another patient, with a very gratifying result, which in all probability will be permanent. The patient is before you, and his history is as follows:

Case 2.—Filling with a physiological salt solution an eye emptied by a cataract extraction. Perfect recovery.

Mr. W. White, æt. fifty-two, of Oneida, N. Y., had a cataract extracted from his right eye three years ago. It was complicated with atrophic choroiditis, yet the operation and recovery were without disturbance, and he had fair sight. He returned April 18, 1899, with a partially thickened capsule, which I successfully discinded, May 21st, with S $\frac{2}{50}$.

The left eye had a tremulous iris and a cataract which oscillated forward and backward with its lower part, the upper being attached to the iris, perhaps to the ciliary body. The eyeball was a trifle softer than normal, light perception somewhat faint, yet projection good, so as to justify the attempt of an operation.

On April 20th, under holocaine anæsthesia, I made an upper corneal section as usual, and endeavored to expel the cataract in its capsule by external pressure. The lens did not present, fluid vitreous escaped freely, while the lower part of the iris moved backward at every pressure. I opened the lens capsule in the upper part by a horizontal incision, and succeeded in expelling the lens by repeated pressure with the thumb on the lower ciliary region and adjacent cornea. I then excised the upper part of the iris with the adherent portion of the capsule. During all this time the watery vitreous had so completely flown out that the scleral capsule lay folded together like a wet piece of linen, over which, in the upper part, the cornea projected like the vizor of a cap. Prepared for the evacuation of the eyeball, I injected into the latter four small syringefuls of a warmed, sterilized, 7 : 1000, saline solution, by which the globe was filled in such a way as to restore its size and shape, make the lips of the wound apply nicely to each other, and replace the iris into its natural position below the black artificial pupil. There was no hemorrhage. The patient counted fingers, and had no pain. The ordinary gauze-cotton dressing, held by a roller, was applied. The recov-

ery was undisturbed. Two days after the operation when the eye was opened the whole pupil was occupied by a large bubble which, diminishing steadily, had disappeared on the fifth day after the operation. In a few days the patient counted fingers at a distance of several feet. May 15th, twenty-five days after the extraction V was $\frac{10}{200}$, field of vision normal; the details of the background, though somewhat dimmed, could be discerned with the ophthalmoscope over the whole fundus. The optic nerve was normal, and the retina in position everywhere.

To-day, May 30, 1899, the patient who will return to his home to-morrow, was examined again. There is a slight tinge of circumcorneal redness when the eye is handled. Field and tension normal, the background seen everywhere without conspicuous changes, the vision $\frac{20}{100}$ fully. No pain or other discomfort in either eye.

CASE 3.—**Injection of salt solution into a collapsed eye after extraction of a complicated cataract in its capsule, with great loss of vitreous.**

May 24, 1899, Mrs. R. Roseg, æt. fifty-eight, had an upward iris coloboma, the result of an operation preliminary to extraction. The lens was sclerosed. The patient was almost totally deaf. Only the loudest words were heard and often wrongly interpreted. The holocainized eyeball was held downward, the cystotome passed over the upper part of the capsule parallel to the corneal section. The lens was pressed into the regular corneal section, it advanced slowly and escaped within its capsule, followed by a considerable quantity of vitreous. The cystotome had failed to open the capsule, a fact not noticed during the operation owing to the difficulty of handling the patient. The eyeball being considerably collapsed, I injected a small syringeful of salt solution into the anterior chamber, upon which the wound united nicely. There was no bleeding. The eye was bandaged in the usual way and the patient put to bed.

She had some pain during the first night. This having disappeared, and the external aspect of the eye being normal, the eyeball was inspected only on the third day. The wound was closed, some episcleral injection, the pupil and iris somewhat dull, perception of light in every direction.

The eye remained quiet and the pupil cleared up gradually. May 30th, the sixth day, she counted fingers, yet not always correctly. Ten days later, patient discharged. Eye free from

irritation. F. n.—J ½. Counted fingers. Thus far only an operative success.

According to the foregoing observations and experiences I believe I am *justified in recommending the injection of a sterile physiological salt solution* (or of any other sterile and indifferent liquid—for instance, boric acid solution) into the eye with a small syringe under the following conditions:

1. When from lack of vitality in old age or any other cause the cornea sinks in so that the eye collapses in such a way as to prevent the wound from closing exactly, a liquid should be injected until the globe has resumed its shape and the lips of the wound apply correctly.

2. Not only remnants of cataract, but also cholesterine and other heterogeneous substances, including perhaps some movable foreign bodies, may be syringed out of the eye with impunity and success.

3. When during the extraction of a complicated cataract the fluid vitreous escapes in such a quantity that the eyeball collapses either totally or in such a degree as to prevent the closure of the wound, liquid should be injected to refill the globe and make the wound close.

4. When from an operation or an injury the eye collapses, injection of a sterilized indifferent liquid may restore the shape of the globe, facilitate the closure of the wound, and ward off infection from the entrance of conjunctival secretion into the eye.

The above histories demonstrate that eyes whose chances of recovery are unfavorable may be saved by intraocular injection,—saved, I am inclined to believe, in a greater percentage than if such treatment were omitted.

NOTE ON THE USE OF EUPHTHALMIN.

By HERMAN KNAPP.

LAST year Messrs. Schering & Glatz put one gram of hydrobromate of euphthalmin[1] at my disposal for trial in my practice. I found that one instillation of a five per cent. solution had too little effect on the pupil to be of much use. One instillation of a ten per cent. solution, however, showed all the advantages which by other observers had been claimed for it. It dilated the pupil in from fifteen to twenty minutes sufficiently for ophthalmoscopic purposes. In thirty or forty minutes a maximum dilatation was reached in most patients, to examine the equator of the lens and the ciliary region as well as under sulphate of atropia. The accommodation was not left intact, but only so little interfered with that the patients did not complain. In from five to ten hours the pupil returned to its previous state. Euphthalmin has no unpleasant side effects. **As an aid in ophthalmoscopic examinations euphthalmin is without a rival.** I have had it in constant use for the last nine months. Whenever an ophthalmoscopic examination does not discover a clear, healthy fundus, I at once dilate the pupil, for I see no good in spending valuable time in trying to get a satisfactory examination when the pupil is narrow and the media are cloudy. In this regard euphthalmin surpasses all of the atropine and homatropine preparations. As a cycloplegic it

[1] I wrote Messrs. Schering & Glatz, 58 Maiden Lane, New York, that the price, $3.00 for one gram, would prevent euphthalmin from becoming popular. They informed me later that the Schering Chemical Works, in Berlin, had reduced the price so that they were enabled to furnish euphthalmin to physicians at $1.75 per gram, including vial.

does not compare with sulphate of atropia, and is even more unreliable than homatropine. In two cases I received the impression that euphthalmin, like atropine, had a tendency to increase the eyeball tension. In many later cases I have not seen this effect any more.

Of late I discovered a new quality of euphthalmin; namely, *it does not irritate the conjunctiva or the skin.* In a cataract patient who, on several occasions, had marked atropine eczema by two or three drops of sulphate of atropia, so that the instillations had to be omitted, euphthalmin instilled several times daily had no irritating effect whatever. I have used euphthalmin also in granulations produced by prolonged use of sulphate of atropia. Under its use the swelling and irritation of the conjunctiva were not increased, but yielded promptly to nitrate of silver or sulphate of copper. I should, however, not omit to mention that it dilates the pupil less powerfully than atropine. I can therefore recommend euphthalmin (10 per cent. sol.), 1st, **for routine use to dilate the pupil in ophthalmoscopy;** 2dly, **as a substitute for atropia in cases of intolerance of that drug.**

NOTE ON THE USE OF HOLOCAIN.

By HERMAN KNAPP.

HOLOCAIN has now been so extensively tested in eye surgery that hardly anything not generally known could be said about it. I may, however, be allowed in brief to state my experience with, and my views on this drug, after a daily use for more than a year.

1st. It is as powerful a local anæsthetic as cocain; over which it has several marked advantages:

a. It acts (1 per cent. sol.) in a shorter time, one-third to one minute, which makes its use very valuable, particularly if we want to anæsthetize the iris. After a corneal section, either for a glaucoma or cataract operation, we can readily anæsthetize the iris by pressing the wound open and letting one or two drops fall into the gap to reach the iris.

b. It does not interfere with the circulation, which accounts for its alleged germicide properties. Blood being the best safeguard of infection, the outflow of blood during the operation carries also the germs away from the wound. It is a very old experience, that wounds for the extraction of cataracts that bleed never were seen to suppurate. Cocain, by its constriction of the blood-vessels and other tissues, sucks tissue juice and germs inward, and thus favors infection. Cocain, causing anæmia, *has the advantage over holocain* 1st *in the diagnosis of vascular organs*—for instance, the swelling of the turbinals of the nasal passages, and 2dly *in facilitating the performance of operation.* A combination of the two may unite the advantages of both.

c. Holocain does not dry the cornea so much as cocain

does. I cannot confirm the statement of authors that it does not dry the cornea at all. Holocain, not interfering with the circulation, possibly dries the cornea only because the anæsthesia gives no incentive to winking. Be this as it may, I have often noticed in cataract extractions that I had to let a drop of liquid fall on the cornea after holocain anæsthesia as well as after that of cocain, only not in the same degree.

2d. For operative work on the eye, especially on the cornea, I have almost completely substituted holocain for cocain. For the removal of foreign bodies holocain is an ideal anæsthetic. It renders the cornea insensible in half a minute, and does not suck in germs that may have contaminated the foreign body.

3d. Cocain is an anæsthetic but no remedy. In all painful diseases of the outer coats of the eye, it ought to be replaced by holocain. If in contagious ophthalmia we instil cocain into the conjunctival sac, we may relieve the pain, but with the tissue juice the germs are sucked deeper; not so in using holocain. When the surgeon of to-day has cut his finger with a knife passed through tissue of doubtful purity, he no longer burns that wound out, but makes it bleed. Holocain can be combined with topical remedies, but I would not countenance the popular combination of cocain with astringents.

4th. As to holocain being a strong germicide and an excellent remedy for septic ulcers of the cornea, as advanced by Hasket Derby,[1] I can say that I have seen good results from the combined use of holocain with antiseptics and caustics; holocain alone also has had a good influence, but in my practice not in so large a proportion as Derby states.

I may conclude these remarks with saying that in holocain we have not only an *excellent local anæsthetic*, but also a valuable *therapeutic adjuvant* in combination with other remedies.

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[1] See these ARCHIVES, xxviii., p. 45, etc.

THE NERVES OF THE HUMAN LID.[1]

By Dr. LUDWIG BACH.

Privatdocent and 1st Assistant.

Translated by Dr. MATTHIAS LANCKTON FOSTER, New York.

(*With Plates XII. and XIII. of vol. xxxiii. of Germ. edition.*)

I HAVE already published in the *Archiv für Ophthalmologie* vol. xli, Abth. 3, the results I obtained by the use of the Golgi-Cajal osmium bichromate silver method on the eyelids of men and rabbits. I have continued these researches, have obtained confirmation of my conclusions regarding the presence of a peculiar tarsal, interglandular, and conjunctival plexus in human lids, and have further found new conditions which I will here briefly describe.

It was noteworthy in my former article that the margin of the human lid was relatively poor in nerve supply, which is not in accord with practical experience in operations. I hazarded the opinion that a greater nerve supply to the margin of the lid must be present and that my result was probably due to the capriciousness of the Golgi-Cajal method. Continued study brought the confirmation of this opinion, together with a surprise, as I had not expected to find this wonderful, fine arrangement.

For the study of this condition frontal sections are best (see Plate xiii). In such sections we see single strong little stems about in the middle of the thickness of the lid, running more or less perpendicularly to the lid margin, which follow pretty nearly the course of the cilia. The single

[1] From the Laboratory of the University Eye Clinic, Würzburg.

nerve stems are usually two or three cilia apart, but united by lateral outshoots, which form a rich, unusually delicate network, particularly close to the margin of the lid and over its entire breadth. This course of the nerve fibres and formation of network is constant.

From this plexus at the lid margin numerous little twigs extend into the epithelium and end in free points between the cells, while others extend forward and backward from the plexus. Those extending forward go to the cilia and surround the glands of the hair follicles; those extending backward supply the Meibomian glands.

Regarding the provision of nerves in the lids of rabbits I have nothing new to advance, but I am inclined to believe that a greater abundance of nerves may also be present here in the tarsus and conjunctiva than I have as yet been able to demonstrate.

Explanation of the Plates.

Plate XII.—Antero-posterior section through the upper lid of a new-born infant, treated according to Golgi-Cajal (double impregnation).

The representation is true to nature, drawn from several specimens. Vergr. Leitz, Syst. IV., Oc. IV., halb. T.

A.—Excretory duct of a Meibomian gland.
A. L.—Outer margin of lid.
J. L.—Inner margin of lid.
C.—Cilia.
Gl. M.—Meibomian gland.
M.—Moll's glands.
W.—Waldeyer's glands.
M. cil.—Ciliary muscle.
C. G.—Conjunctival plexus.
J. G.—Interglandular plexus.
T. G.—Tarsal plexus.
L. G.—Plexus at the margin of the lid.

Plate XIII.—Frontal section through the upper lid of a new-born infant, treated according to Golgi-Cajal (double impregnation).

The representation is true to nature, drawn from two specimens. Object., II. Oc. II. K. T. Seibert.

N.—Little nerve roots, which run in a more or less perpendicular direction in the lid from above downward.

L. R. G.—Plexus at the border of the lid; the ramification and diffusion of the nerve on the margin of the lid.

V. Z.—Connecting filaments between the little nerve trunks approaching the margin of the lid.

C.—Cilia.

Gl. M.—Meibomian glands.

L. R.—Margin of the lid.

A.—Excretory ducts of the Meibomian glands.

THE CORNEAL AND SCLERAL NERVES AS SHOWN BY GOLGI-CAJAL'S OSMIUM BICHROMATE SILVER METHOD.[1]

By Dr. LUDWIG BACH,

Privatdocent and 1st Assistant.

Translated by Dr. Matthias Lanckton Foster, New York.

(*With three Illustrations on Plates XIV. and XV. of vol. xxxviii. Germ. edition.*)

I.—THE NERVES OF THE CORNEA.

SINCE Cohnheim introduced gold chloride into histological technique for the demonstration of the nerves of the cornea, the previously scanty literature on the subject has grown considerably. Excellent as gold chloride is for the demonstration of the corneal nerves, questions arise which it cannot answer. Thanks to this method, the abundance and arrangement of the nerves in the cornea have been determined; we know that these nerves form plexuses which are found at different depths and are divided into a stomaplexus, a subbasal, an epibasal, and an epithelial plexus.

More lately they have been studied again by Dogiel by means of methyl blue. According to Dogiel from 60 to 80 little nerve trunks enter the cornea, 40 to 50 of which approach the anterior, 20 to 30 the posterior surface. The anterior and posterior little nerve trunks divide dichotomously and the separate branches form in the tissue of the cornea a large-meshed plexus. The division of the anterior

[1] From the Laboratory of the University Eye Clinic, Würzburg.

trunks occurs earlier than that of the posterior, the places of division are occupied by round and oval nuclei and by interlacing fibres and fibrils entering into the little nerve trunks. In the formation of the principal plexus the peripheral part, close to the border of the cornea, is made from the twigs of the anterior branches of the little nerve trunks, while the central part is made almost exclusively from the twigs belonging to the posterior little nerve trunks. From the principal plexus more or less thin twigs penetrate Bowman's membrane and form a subepithelial plexus. In the peripheral part of the cornea these fibres arise from the anterior, in the central part from the posterior, little nerve trunks. Almost every corneal layer contains a nerve plexus, united each to each, except in the most posterior, next to the membrane of Descemet, where there is none. These plexuses appear to be equally developed in the peripheral as in the central part, so that their loops have a characteristic rounded form. We are also indebted to Dogiel for a careful study of the endings, as well as of the arrangement, of the nerves in the cornea.

Our knowledge in regard to the subject is then very great, and the chief object of this paper is not to advance a new idea, but furnish a plate which shows a distinct superiority over the delineations of the nerves of the cornea hitherto presented. I have treated the cornea of a new-born infant wholly according to this method, and have obtained so beautiful and, especially for the osmium bichromate silver method, so perfect an impregnation of the nerves that I have thought it worth while to publish the drawing.

The drawing, Fig. 1, Plate XIV., is not pieced together from several preparations, but is from one single cornea and is true to nature in its reproduction.

We see thirty more or less marked nerve twigs enter the cornea, divide dichotomously, and spread out in the various layers of the cornea. They do not form a true reticulum, but we see a network of fibres crossing each other many times, irregularly, and showing a characteristic type, gradually growing finer and finer and ending with free extremities.

From this drawing one gets the impression that the for-

mation of network was less in the periphery than in the central portion. In other incompletely impregnated human corneæ I have seen a more strongly marked network in the periphery.

Such a network in a higher degree, partly a true reticulum, is present in rabbits (see Plate XIV., Fig. 2) and mice.

A detailed description is unnecessary because the delineation, which is true to nature, suffices to quickly set forth the relative conditions.

II.—THE CILIARY NERVES, PARTICULARLY THE NERVES OF THE SCLERA.

In contrast to the foregoing, the researches in regard to the nerves of the sclera are very scanty, and their results slight. In the text-books this subject is usually dismissed with a few words, in some the only nerves mentioned are those which penetrate the sclera, together with the ciliary vessels, to reach the uvea. Even in the work of Graefe-Saemisch we do not find much more.

Helfreich was the only one who, some time ago, described accurately, though from only a few specimens prepared with gold chloride, the many-branched, terminal nerve plexus of the sclera. According to his statement these fine nerves, which he considered to be the scleral nerves proper, are derived in frogs from four or five little trunks, which pass to the globe in the lateral part of the connective-tissue sheath above the optic nerve. The principal nerve trunk belonging to these was not found. In the neighborhood of the entrance of the optic nerve these little trunks form a sort of circular interlacement, and run from there, undergoing repeated dichotomous division, farther forward until they suddenly lose their medulla. These fine transparent fibres form a rich plexus. Free pointed ends well forward in the sclera have also been observed in man by Waldeyer.

Of late attention has been directed anew to the subject, not only to the scleral nerves proper and their endings, but to the ciliary nerves in general. In connection with this subject Boucheron, Peschel, Michel, Retzius, Kölliker, and Axenfeld deserve particular mention.

Of incisive importance to this entire question was the determination of the nature of the ciliary ganglion, which was shown to be a sympathetic ganglion by Michel, Kölliker, Retzius, and d'Erchia. Michel is of the opinion that the nerves coming from the ciliary ganglion only, are made up of sensitive and sympathetic fibres, that, on the contrary, the originating fibres of the ciliary ganglion from the oculomotorius, end therein, while surrounding the ganglion cells.[1] He thinks that the ciliary ganglion is functionally motor, the ends of a number of oculomotor fibres subjoined, that the excitation is received from these and is then communicated as a motor impulse by way of the nerve processes through the ciliary nerves to the sphincter pupillæ and the ciliary muscle. This condition is alleged to explain the strange fact that here two smooth muscles are supplied by a motor nerve.

Considerable study has also been devoted to the course of the ciliary nerves, their points of entrance, their relations to and their course in the sclera. It was long believed that the ciliary nerves were all inserted into the posterior half of the globe, and that only isolated, perforating twigs were found farther forward, described, and their utility estimated. It is not yet certain whether these form a constant condition or only accidental varieties. This has been critically considered by Axenfeld, who from his own researches emphasizes the existence of episcleral, and the presence of remarkable anteriorly perforating twigs. My own experience in regard to the ciliary nerves rests mainly on occasional results which are in a certain measure due to unsuccessful impregnations of the retina.

The delineation of the nerves is almost always obtained by the Golgi-Cajal method but only rarely could I find nerve fibres in the sclera by Weigert's method.

In the majority of cases the eyes were freshly taken from rabbits, occasionally from human fœtuses and new-born children.

[1] Investigation has convinced me of the truth of this hypothesis. If one removes the iris and ciliary body, changes occur in the ganglion cells of the ciliary ganglion, but not in the region of the oculomotor nucleus.

The accompanying drawing, Plate XV.,was made from preparations of the sclera of rabbits, but I am inclined to think that the conditions do not materially differ from those in human sclera. From the drawing it appears that in the most widely different places in the section of the globe, both before and behind the equator, nerves of various sizes enter the sclera, which in part branch out to form a network, in part pierce through the sclera and reach the uvea. The scleral nerves take very variable courses. We see fibres which run in the sclera for long distances, others which pierce the sclera directly, and others which send branches both backward and forward from the little nerve twigs. Striking also are the relatively strong little twigs anteriorly in the region of the ciliary body, a region abundantly supplied with nerves, a fact every ophthalmologist can verify by his practical experience. I have the impression from my preparations that the sclera is not so poorly supplied with nerves as it has hitherto been considered to be.

It has occurred to me that the tolerably strong relations of the nerves correspond to the by no means scanty scleral vessels, a condition which appears to indicate that we have to do with rather numerous sympathetic nerve fibres in the sclera.

A practical observation to be derived from the tracing of several prepared specimens is that it is very difficult to reach all the ciliary nerves in an optico-ciliary neurectomy.

I am aware of the incompleteness of what I present, but I think I am able to see, even in this very scanty material, an advance in the investigation of the ciliary nerves, particularly those of the sclera.

Explanation of the Plates.

Fig. 1, Plate XIV.—The surface of the cornea of a new-born child, enlarged. Treated according to Golgi-Cajal. The drawing is made true to nature from one specimen. The margin of the cornea is distinct; one sees the entering little nerve trunks, which divide dichotomously.

Fig. 2, Plate XIV.—The drawing is made from the cornea of a newly born rabbit, which has been treated according to Golgi-

Cajal. The corneal margin dotted. It embraces a quadrant of the cornea, and we see entering little nerve twigs, which form a delicate plexus in the various layers of the cornea.

Plate XV.—This drawing is made from a combination of several specimens. It presents the little nerve trunks entering and ramifying in the sclera of a rabbit. Anteriorly the ciliary bodies, posteriorly the optic nerve, are plainly marked. The section extends from the margin of the cornea to the region of the optic nerve. Some of the incisions near the bottom were made obliquely. By the drawing it is made plain where the scleral nerves can enter, as we see them pass by, branch, and end. The specimen was from a rabbit just born at full term and was treated according to Golgi-Cajal (double impregnation).

DESCRIPTION OF A PORTABLE ELECTRO-MAGNET, AN ORIGINAL DEVICE, TO BE USED IN CONNECTION WITH ANY INCANDESCENT ELECTRIC-LIGHT CURRENT, FOR THE REMOVAL OF PIECES OF STEEL FROM THE INTERIOR OF THE EYEBALL.

By Dr. WALTER B. JOHNSON, Paterson, N. J.

(*With four figures in the text.*)

At the January (1899) meeting of the Section on Ophthalmology and Otology of the New York Academy of Medicine, the report of a case of removal of steel from the eyeball served to introduce the new portable electro-magnet used in the operation. The magnet was then in a comparatively incomplete stage of development, although its action was satisfactory. Since the preliminary presentation, important alterations have been made, and it is now pre-

Fig. 1.

sented in complete form and the method of its construction fully described in detail. The core of the magnet is made of the finest grade of Swedish iron which is reannealed and is susceptible of the highest possible degree of magnetic saturation. Its general shape is shown in Fig. 1; its length over all is seven and one half inches; its length within the shoulders for the tips is five and seven eighths inches, and its diameter five eighths and one sixteenth of an inch; its weight

is eleven ounces. One of the tips or ends is made ovoid in form and extends one half inch beyond the shoulder, which is to rest on the limiting fibre washer of the spool; the other end is an elongated tip one and one eighths inches in length from the shoulder, which may be used in the interior of the eyeball if necessary; the tips may be made of any desired shape, length, or thickness. The magnetic energy, however, decreases with the weight of metal

FIG. 2.

and the distance from the shoulder, which is the point of complete magnetic saturation. The core is made in two halves: the one half to telescope; the other, to insure magnetic union when placed within the spool, as shown in Fig. 2. Each half of the core is fitted with a key to lock it in its proper position in the brass tube of the spool, which is slotted for the purpose; when the magnet is energized the core is firmly locked in every position. It is made in this manner for two reasons: primarily to permit its removal from the tube for sterilization, and also to allow the insertion of a new core in case it should become unduly

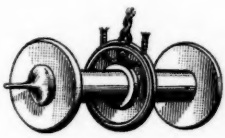

FIG. 3.

heated during an operation. The spool: in the construction of the spool for the magnet a tube of brass six inches long and three quarter inch outside diameter is fitted with three fibre washers—one in the centre and one on each end, as shown in Fig. 3. The end washers limit the winding; the middle washer is so placed to permit anchorage of the lamp-cord leads to the centre of the magnet so that they will not be in the way of the operator.

The winding: the magnet is wound with two pounds ten ounces of No. 27 single silk-covered magnet wire; the number of turns of the wire on the magnet is ten thousand, which gives five thousand three hundred and fifty-five ampere turns at one hundred and ten volts. One half of the magnet is first wound, when the spool is reversed in the lathe so as to continue the winding of the other half in such a manner that the two halves may be coupled in simple series by joining the two bottom wires. This also brings the terminals of the winding of each half of the magnet to the top layer, where they may be joined with the lamp-cord leads which are firmly anchored to the centre washer of the spool,

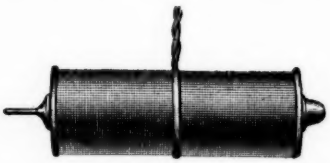

FIG. 4.—JOHNSON MAGNET.

as shown in Fig. 3. The coupling of the two halves of the magnet winding in simple series being thus completed, the resistance is two hundred and five ohms.

The conduction cord, the lamp-cord leads attached to the centre washer, is a ten-foot length of ordinary incandescent-lamp wire, and to the opposite end of this wire is joined the ordinary Edison plug which can be used in connection with the lamp socket of any direct incandescent Edison electric-light current. The Edison plug, by the application of an adapter, can be changed for use in connection with any Thompson-Houston lamp socket, or by adjusting the Westinghouse attachment plug it may be used in connection with any Westinghouse lamp socket; it is therefore applicable for use at any place in which a one hundred and ten or one hundred and twenty volt current for direct incandescent electric lighting may be found; it cannot be used in connection with the alternating current. The complete magnet, as shown in Fig. 4, is seven and one half inches long from tip to tip. One tip is one half inch in

length and ovoid in form; the other tip is one and one eighth inches in length and elongated, its diameter being three thirty-seconds of an inch; the length of the spool, including the washers, is five and seven eighths inches; the diameter of the winding is two inches, the diameter of the washers two and one eighth inches, the weight of the iron core is eleven ounces, and the total weight of the magnet is three pounds and seven ounces; the winding wire is covered between the washers with thin leather.

The advantages over other magnets used for similar purposes are: Its portability, which permits its application at any desired angle as related to the position of the foreign body in the eyeball, and its use with the patient on the back or in any other desired position. Its adaptability for use in any place where a direct incandescent electric-light current may be found. Its applicability to use for traction by external application or for the introduction of the tip for direct approximation within the eyeball. Its strength—the ovoid tip of the magnet has magnetic energy in apposition with the end of a spring scale equal to a pulling strength of six pounds, and the elongated tip for use in the interior of the eye has a pulling strength of nearly one pound, so that it possesses strength slightly in excess of that of any of the other various forms of magnet previously introduced for like purposes. It can be furnished complete for about fifteen dollars, which will undoubtedly prove an important factor in its probable adoption for general use.

The sample magnets were made by J. H. Bunnell & Co., of 76 Cortlandt Street, New York City.

REPORT OF THE SECTION OF OPHTHALMOLOGY AND OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. J. Herbert Claiborne, Secretary.

MEETING OF MARCH 20, 1899, THE PRESIDENT, DR. PETER A. CALLAN, IN THE CHAIR.

Dr. Herman Knapp presented a case of **traumatic cataract and iris cyst.** A young man received an irregular wound of the cornea, upwards and inwards, about four months before, which caused traumatic cataract. Two weeks ago an iris cyst was observed upwards and inwards, springing from the sinus of the anterior chamber; the cyst was transparent. Dr. Knapp referred to the opinion of Eversbusch that *iris cysts are due to an inversion of the ligamentum pectinatum.* He entertained the same views, and the case presented was a striking illustration of the theory. In removing these cysts, he uses a sharp spoon and removes as much tissue as possible from the iris-angle.

Dr. C. H. May exhibited a case in which he had made a **Thiersch graft** for the purpose of **restoring a socket that had been obliterated by adhesions after enucleation.** The result was excellent. Later in the evening he read a paper describing the operation in detail (see below).

Dr. E. Gruening also showed a case in which he had made a Thiersch graft for the relief of symblepharon. The eyeball was firmly and completely attached to the upper lid socket; the eye could not be opened. The symblepharon was dissected away and the Thiersch graft made. He put the graft on a shell, the raw surface being towards the lid; on the tenth day he removed the shell. Two days afterward the graft had to be trimmed. The result was excellent; whereas the eye could not be opened before, it could

now be opened easily, and movements in all directions were unrestricted. Dr. Gruening preferred the Thiersch graft to any other procedure in this class of cases.

Dr. KNAPP said he saw what appeared to be ulcers on the graft. Dr. Gruening said there were none; that the appearance was the normal one of the skin graft.

Dr. T. R. POOLEY said he considered the immediate result in these cases good, but he doubted if the ultimate result would be so good.

Dr. W. M. LESZYNSKY presented a case of **acromegaly, and called particular attention to its ocular symptoms.** A policeman of thirty-six years, who had been in service for eleven years, had been in excellent health up to the time of his marriage nine years ago. Since his marriage he had indulged in venereal excess and had drunk whiskey to excess for many years. He had greatly enlarged hands and feet, lower jaw and lower lip, and occipital protuberance. Both clavicles and the sternum were also enlarged. One year ago he noticed that his vision commenced to be blurred. During the last three months he has been unable to read. Since the first examination, four months ago, the central vision has been reduced to $\frac{20}{40}$ in each eye. There was left *bitemporal hemianopsia* for form and color, and the remaining portion of the color fields was contracted. In the right eye the field for white was normal, while there was a temporal hemianopsia for red and green; and the remaining portion of the color field was also contracted. The pupils did not react to light but contracted feebly in convergence. The *sense of smell was totally abolished* and the patient suffered much from *somnolence.* Skiagrams of the hands and feet were exhibited; also drawings of the visual fields.

In the *discussion* that followed, Dr. W. A. HOLDEN said that cases of acromegaly were not so uncommon, and that the eye symptoms were well recognized and were due to the enlarged pituitary body pressing upon the chiasm. The commoner type of field in these cases was the *concentrically contracted* one, and the bitemporal hemianopic field though more characteristic was less frequent. The character of the defect in the visual field depends upon the position of the enlargement in the pituitary body.

Dr. Holden called attention to the frequency of glycosuria in acromegaly.

Dr. Leszynsky replied that there was no sugar in the urine

of the patient he had exhibited, and he doubted that it was a constant symptom.

Dr. R. O. BORN presented a patient, a boy whom he saw two weeks before. There were **nodular swelling of the iris in one eye and circumcorneal injection.** There were nodules and blood-vessels in the iris. There was exudate in the pupil and the vitreous humor was cloudy. Though no foci of tuberculosis had been found in other portions of the body, he was confident that it was a case of tubercular iritis. He hoped to be permitted to remove the eye.

Discussion.—Dr. POOLEY agreed in the diagnosis, but said he saw no reason for removing the eye except from a pathological standpoint. Clinically he could not see any advantage in doing so. He had made a careful study of this subject some years ago and he could find no reason in the literature on the subject for removing such eyes.

Dr. GRUENING said he did not agree with Dr. Pooley ; he had removed such an eye from an old man on one occasion ; six months afterward one of his testicles was removed for tuberculosis. He finally died of an intercurrent affection, and tubercular deposits were found in his lungs.

Dr. Born replied that inasmuch as the eye was blind and painful, he saw no reason why he should not operate.

Dr. W. H. BATES presented a child in which there was a yellowish-white reflex from the fundus of one eye. It had had meningitis six months before. T.—. He had diagnosed cyclitis.

Discussion.—Dr. H. KNAPP said it was a case of metastatic choroiditis after cerebro-spinal meningitis.

Dr. J. A. WIBORN presented a case of **coloboma of the sheath of the optic nerve** in the right eye of a man from the practice of Dr. Webster. The patient had never noticed any defect in the eye although he had been employed on a railroad for twenty years. V $\frac{20}{20}$, w.— 1.5 D.

Dr. H. KNAPP was to have read a paper on **the use of the Haab magnet for removing foreign bodies from the interior of the eye.** On account of the late hour he contented himself with briefly stating his views on the utility of a large magnet, and cited cases illustrating its usefulness and its limitations.[1] The first class of cases in which it was useful was that in which the foreign body is in the anterior part of the eye and can

[1] The paper is published in this volume, p. 165.

be seen. Other means are likewise of use in these cases, such as the forceps and scissors. He cited a case in which the Haab magnet had caused a small foreign body to jump through the wound in the limbus corneæ. He laid stress on the necessity of making the power line of the magnet coincident with the line on which the foreign body lies. Sometimes even this would fail, and he cited a case (not from his practice) in which the foreign body slipped into the ciliary region, and could not be extracted.

He referred to another class of cases in which the foreign body cannot be seen, but is obviously within the eye, and the magnet can neither discover nor remove it. When the foreign body is in the anterior part of the eye, the magnet when brought near will often cause the sclera to bulge at the point corresponding to the foreign body. In this respect the magnet is of value as a diagnostic means. When the foreign body is far to the rear, an incision should be made and the Hirschberg magnet introduced into the vitreous humor. He cited several cases illustrating this class. There had been reported thirteen cases of the use of Haab's magnet in this country, and from his own experience and that of others, he felt inclined to accept Haab's dictum that the "strongest magnet is the best magnet."

Discussion.—Dr. F. C. Ard said he had used the Haab magnet in one case with a bad result. A piece of steel had entered through the cornea of a working-man and lodged in the posterior pole of the lens. The magnet point was placed before the lips of the corneal wound and the foreign body was drawn out. The eye, however, became atrophic later and had to be removed.

Dr. Peter A. Callan said that when the foreign body was in the vitreous chamber he always made a large incision under the external rectus, and then used the magnet by placing its apex opposite the scleral incision. As a diagnostic means he considered the magnet of Haab unsurpassed. The patients feel a drawing sensation, and there is often a bulging of the eye over the region of the foreign body, when the magnet is applied. He had seen this last phenomenon happen when a piece of iron as small as $\frac{1}{60}$ of a grain was in the eye. He had had a case of foreign body in the posterior pole of the lens, and had observed the lens move backward and forward on the alternate withdrawal and application of the magnet.

Dr. Gruening had had four cases, and he considered the magnet of value in two ways: first, as a sideroscope, and second,

as an extractor. In the four cases, in which the foreign bodies had been removed through the original wound, he had saved two eyes with good final vision ; the other two had very little vision.

Dr. C. H. MAY read a paper on the **restoration of the conjunctival cul-de-sac by means of Thiersch skin grafts.** He described the method employed in introducing and retaining the shell and the laying on of the graft. Also the after-treatment. The paper was read as an illustration of the case he had presented earlier.[1]

Discussion.—Dr. GRUENING said the grafts adhered so firmly to the shell there was no danger of their coming off. There was no necessity of sewing them on and hence no necessity for the apertures in the shell. In fact it was difficult to get them off.

Dr. W. E. LAMBERT had tried a Thiersch graft in a case of complete closure of lids over socket. He first tried inserting a deep lead wire, allowing it to remain for a while, and cutting down on it afterwards. There was no satisfactory result from this ; afterward he used a Thiersch graft, but inserted a lead shell instead of a porcelain one. There was profuse hemorrhage at first ; after two days he put on the graft. There was but little reaction. He hoped for a good result and would exhibit the case later.

[1] Published in this volume, p. 182.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1898.

By Dr. ST. BERNHEIMER, in Vienna; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Prof. P. SILEX, in Berlin;

WITH THE ASSISTANCE OF

Dr. G. Abelsdorff, Berlin; Dr. Swan M. Burnett, Washington; Dr. Dalén, Stockholm; Dr. Herrnheiser, Prague; Prof. Hirschmann, Charkow; Dr. Krahnstöver, Rome; Dr. P. von Mittelstädt, Metz; Prof. Da Gama Pinto, Lisbon; Dr. Richard Schweigger, Berlin; Dr. Sulzer, Paris; Dr. L. Werner, Dublin; Dr. C. H. A. Westhoff, Amsterdam; and others.

Translated by Dr. Ward A. Holden.

Sections I.–III. Reviewed by Prof. Horstmann.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

476. Seligmann. The methods of microscopic examination of the eye. Berlin, 1899: S. Karger. (An excellent text-book.)

477. Edgren. Arterio-sclerosis. Clinical studies. Leipsic, 1898: Veit & Co.

478. Peunoff. A short report of eye operations done on out-patients in the years 1888–1897. *Wjest. ophth.*, 1898, 4–5.

479. Cohn, H. Report on 4000 eye operations. *Wochenschr. f. Ther. u. Hygiene d. Auges*, II., No. 1.

480. *Transactions of the Ophthalmological Society of the United Kingdom*, vol. xviii., 1898.

481. Swanzy. On some of the congenital anomalies of the

eye, as illustrated in the *Transactions* of the Society; being an inaugural address. *Trans. Ophth. Soc. Un. K.*, xviii., p. 1.

482. Report of a committee of the Ophthalmological Society to consider the relative value of simple excision of the eyeball, and the operations which have been substituted for it. *Ibid.*, p. 233.

EDGREN (477) presents a comprehensive account of arteriosclerosis, including its relations to diseases of the eye.

PEUNOFF (478) made 4575 operations in all. The number of extractions was 993, with 3 per cent. of losses. Leucomas are tattooed by making a pocket in the opaque tissue by means of the Graefe knife, into which he introduces the India ink with de Weeker's hollow needle. HIRSCHMANN.

480. The present volume contains 412 pages, occupied by 67 communications, with nine plates and illustrations in the text. Six of the plates are reproductions of skiagraphs of foreign bodies in the eye and orbit. The most important papers are: The Bowman lecture, by Priestley Smith, on the etiology and educative treatment of convergent strabismus; a report of a committee of the Society to consider the relative value of simple excision of the eyeball, and the operations which have been substituted for it; a paper on epithelial xerosis, by Stephenson; retinitis proliferans, with post-mortem examination, by P. Fleming; the pathogenesis of anterior polar cataract by E. T. Collins; several cases illustrating the localization of foreign bodies by the X-rays; experiments on the union of corneal wounds, etc. L. WERNER.

SWANZY (481) refers to these anomalies under the following headings: Anomalies of motion, colobomata of the iris, microcephalus with proptosis. In the last instance the author completed the examination of the case which was originally described by Power (vol. xiv., p. 212). All the sutures were ossified, with the exception of some of the occipital, hence the brain in its growth uplifted the vault and dragged the orbital plates up, thus oblitering the eye sockets. WERNER.

482. This important report, which occupies 74 pages, is based on replies from 48 oculists, statistics from various sources, and on three tables of cases, viz.: (1) 120 cases of Mules operation; (2) 20 cases of Mules operation; (3) 40 cases of insertion of artificial globe in Tenon's capsule. Evidence was collected in reference to (1) single excision, (2) evisceration with or with-

out artificial vitreous, (3) insertion of a globe into Tenon's capsule, (4) abscision, (5) optico-ciliary neurotomy, and (6) neurectomy. The questions considered were: I., Relative risks of meningitis and, II., of sympathetic ophthalmia; III., other disadvantages of each operation; IV., special advantages with regard to wearing an artificial eye; V., important points in technique of operations; VI., to what extent should the choice of operation depend on the nature of the case.

I. In 10,734 cases of excision 7 deaths occurred; in these the eye was suppurating. But meningitis may arise from suppurating eyes without operation, as proved by cases by Warlomont, Knapp, and Tay. No deaths after the other operations occurred, but the number of cases is not large.

II. Five cases of sympathetic ophthalmitis after Mules operation are recorded, while none was found as a result of simple evisceration. In all the sympathizing eye recovered. Records were also found of sympathetic ophthalmitis after neurotomy and neurectomy. In the 10,734 cases of excision only 2 undoubted cases of sympathetic ophthalmitis occurred in which the interval after operation was more than eight weeks, whereas 5 cases were found after neurotomy and neurectomy with an interval of ten weeks or more. Three cases of sympathetic ophthalmitis after abscision are related.

III. A table of 10 cases of measurements of the orbits in adults having had one eye removed in childhood showed that there was no want of development of the orbit. Enucleation causes defective prominence and motion of artificial eye. Evisceration causes more reaction, prolonging recovery, sometimes sloughing or irritation of stump; Mules operation in addition, occasional escape of globe, breakage of globe from subsequent injury. This is more a theoretical than a practical objection. Neurotomy and neurectomy have as drawbacks, free hemorrhage into orbit and protrusion of eye, ulceration of cornea, return of pain, papillitis in the other eye. The disadvantages of abscission are hemorrhage, suppuration, irritability of the stump.

IV. All operations are better than excision as regards appearance. With insertion of artificial vitreous position and movements are better, and there is no tendency to accumulation of secretion in socket.

V. In excision the most important points are thorough asep-

sis, and the prevention of the escape of purulent contents of the globe into the socket. In Mules operation these points should be attended to: asepsis, thorough cleansing of scleral cavity, arrest of hemorrhage, the glass globe should fit loosely in the sclerotic, finally accurate opposition of the lips of the scleral wound.

VI. This question is discussed in relation to intraocular malignant growths, suppurative panophthalmitis, wounds likely to cause sympathetic ophthalmia, anterior staphyloma, shrunken eyeballs, and painful blind glaucomatous eyes. A number of very important cases illustrating various points are recorded in this paper, to which is added an appendix containing a separate report by Bickerton, who would confine excision to cases of intraocular growths, extensive wounds of sclerotic, shrunken globes in which uvea cannot be removed, and cases where sympathetic ophthalmia has already begun. In all others he prefers evisceration. WERNER.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

483. SCHNAUDIGEL. The immigration theory and the doctrine of dormant cells. *Graefe's Archiv*, xlvii., 2, p. 387.

484. WEICHSELBAUM and MÜLLER. On the Koch-Weeks bacillus of acute conjunctivitis. *Ibid.*, 1, p. 108.

485. VAN GEUNS. On the development of cataract after ligation of the venæ vorticosæ. *Ibid.*, 2, p. 249.

486. BÄCK. Experimental histological investigations on contusion of the eyeball. *Ibid.*, 1, p. 82.

487. SCHWARZ. On giant cells about cilia in the eyeball. *Ibid.*, 1. p. 68.

488. KRÜCKMANN. On a case of meningo-encephalocele of the eyeball. *Ibid.*, 1, p. 50.

489. MONESI, LUIGI. The epithelium in the repair of wounds of the cornea. *Giorn. d. R. Accad. di med. di Torino*, lxi., 8.

490. STRADA. On the goblet cells of the conjunctiva. *Boll. de la Soc. med.-chir. di Pavia*, 1898, No. 3.

491. VAN DUYSE. The pathogenesis of cyclopia. *Arch. d'ophth.*, xviii., 10, p. 623.

492. HIPPEL. On congenital anophthalmus. *Graefe's Archiv*, xlvii., 1, p. 227.

493. PIXENTI. On a pupillary reflex of aural origin. *Atti c. rend. dell' Acc. med.-chir. di Perugia*, ix., 3.

494. HIRSCHBERG. Remarks on magnet operations. *Berliner klin. Wochenschr.*, 1898, No. 46.

According to SCHNAUDIGEL (483) the wandering cells that appear in the cornea after injury, at a time when there is still no reaction on the part of the corneal tissues, contain eosinophilous granules and are therefore leucocytes which have wandered in from the corneal margin. Grawitz's view that the infiltrating cells arise autochthonously from dormant cells and after the inflammation has passed off return to this state, is, therefore, incorrect.

WEICHSELBAUM and MÜLLER (484) found the Koch-Weeks bacillus in the secretion of an epidemic of conjunctivitis, the number of bacilli varying with the intensity of the disease. The secretion usually contained other micro-organisms in small number. The bacillus could be cultivated with difficulty on human-blood serum agar-agar, but apparently only when certain saprophytes were grown at the same time. These colonies when inoculated on the healthy conjunctiva produced the disease. The vitality of the bacillus seems to be low and inoculation can take place only when the secretion is fresh. Children are especially susceptible.

VAN GEUNS (485) ligated the venæ vorticosæ in a number of rabbits. The tension became increased at once, blood appeared in the anterior chamber, the lids became œdematous, there was exophthalmus, and the cornea exhibited opacities and new-formed vessels. The cornea again became clear in three weeks. In some eyes total cataract developed ; in others partial cataract.

According to BÄCK's (486) investigations the retina appears normal in cases of commotio retinæ and there are no subchoroidal hemorrhages. The cause of the opacity is a choroidal exudation between the choroid and the retina, the liquid portion of which may be taken up by the retina by imbibition, rendering the retina cloudy. The cause of the exudation is a traumatic paralysis of the vessels.

SCHWARZ (487), in three eyes that had been destroyed by injury, found in the interior of the eye cilia surrounded by granulation tissue in which were giant cells.

MONESI (489), after making a series of experiments, agrees with Ranvier and others that the epithelium which covers corneal wounds is old epithelium from the region about the wound. He

finds, however, in opposition to Ranvier, that there is a zone of actively proliferating epithelium with numerous karyokinetic figures lying in the middle and deeper layers of cells. This proliferating zone lies at a distance from the margins of the wound and is found as early as one hour after the injury, before the lateral migration of the epithelial cells begins. Hence he concludes that the proliferation of cells is not the result of the migration of cells to cover the defect but the active cause of that migration.

KRAHNSTÖVER.

STRADA (490) believes the goblet cells of the conjunctiva to be cells normally and constantly found, whose function is that of forming mucus. This view he bases on a great number of examinations of specimens. The goblet cells originate he believes in the deepest layers of the epithelium. KRAHNSTÖVER.

VAN DUYSE (491) in the continuation of his paper describes 4 more cyclopic eyes and gives a *résumé* of the findings in the 13 cases. Case 12 differed from the others in that the cyclopic eye of a rhinocephalic fœtal pig was not formed by the junction of the two ocular protons. Here the cyclopia was atypical, one ocular vesicle having been destroyed early or having never been formed. V. MITTELSTÄDT.

In catheterizing the Eustachian tube PIXENTI (493) observed marked oscillitory movements of the pupil which came on whenever the attempt at catheterization was repeated. The author calls this a reflex action, without offering a more definite explanation. KRAHNSTÖVER.

III.—INSTRUMENTS AND REMEDIES.

495. BRAUNSTEIN. Protargol in eye diseases. *Wratsch*, 1898, No. 42.

496. ESMANN. On the use of protargol as a prophylactic against blennorrhœa neonatorum. *Bibl. for lager*, 1898, No. 49.

497. DISSLER. Protargol in eye diseases. *Wratsch*, 1898, No. 49.

498. GUTTMANN. Atropine in ocular practice. *Wochenschr. f. Ther. u. Hyg. d. Auges*, 1898, Nov. 24.

499. EMMERT. Hyoscine (scapolamine) and hyoscyamine. *Corr.-Bl. f. Schweizer Aerzte*, 1898.

500. LUCCIOLA and CIANCIOLO. A new astigmometer. *Giorn. med. d. R. esercito*, xlvi., 3.

501. SCHIÖTZ. Dr. Schiötz's prism apparatus, and its use. *Norsk Mag. f. lægevidensk.*, 1898, No. 10.

502. SACHS The sideroscope and the electro-magnet; their use in ophthalmology. *Wiener klin. Wochenschr.*, 1898, No. 43.

BRAUNSTEIN (495) recommends protargol in acute conjunctivitis and in purulent keratitis with hypopyon. In blennorrhœa of the conjunctiva or of the lachrymal sac, the results were less favorable. In trachoma the author obtained no improvement, and in chronic inflammations but little. HIRSCHMANN.

ESMANN (496) undertook a number of experiments in order to determine whether protargol irritates the conjunctiva of the newborn and whether it is as efficacious as silver in preventing blennorrhœa. He concludes that silver is the more valuable prophylactic, although protargol is less irritating and has the advantage of not staining the clothing. DALÉN.

DISSLER (497) finds that protargol must be used in a solution ten times as strong as silver to have the same effect. Whether protargol is superior in any way to silver is not clear.

HIRSCHMANN.

GUTTMANN (498) believes that atropine is indicated for diagnostic purposes in cases of cataract, but therapeutically it is of value in diseases of the iris only, and not of the cornea.

EMMERT (499) uses hyoscine (which is identical with scopolamine) in 1 % solution. Its advantages are the rapidity of its aotion, intensity of its action, duration and nature of its action on the pupil and accommodation, its harmlessness as respects the conjunctiva, its lack of effect on the heart and brain, and the permanence of its solutions. In its uniformity of action and in other respects, he regards it as the best of the mydriatics.

The astigmometer of LUCCIOLA and CIANCIOLO (500) does not differ particularly from those now in use. It consists of a telescope provided with a disc which rotates, bearing as a mire a white quadrant with diagonal lines. In cases of astigmatism the quadrant becomes distorted into a rhomb and the change in length of the diagonals is read directly from the ocular.

KRAHNSTÖVER.

Sections IV.–VII. Reviewed by DR. ST. BERNHEIMER, VIENNA.

IV.—ANATOMY.

503. BERNHEIMER. The reflex path of the pupillary reaction, according to anatomical investigations on embryo human brains and experiments on monkeys. *Graefe's Archiv*, xlvii., p. 1.

504. SCHNELLER. Anatomico-physiological investigations on the ocular muscles of the new born. *Ibid.*, p. 178.

BERNHEIMER (503) studied the reflex path of the pupillary reaction in embryo brains, in monkeys' brains by degeneration methods, and by experiments on living animals.

His conclusions are as follows: The partial crossing of the optic-nerve fibres in the chiasm is absolutely proven. The fibres for the pupillary reaction also cross partially in the chiasm. The pupillary fibres run with the other optic-nerve fibres to the external geniculate body, where they form a separate bundle which passes in a curved course into the anterior quadrigeminal body, running beneath the aqueduct and ending at the sphincter nucleus. Each sphincter nucleus receives fibres from each eye, and, furthermore, there is a central communication between the two nuclei. The author's experiments confirm the views of others that the ganglion habenulæ and Gudden's and Darkschewitsch's nuclei have no relation to pupillary reaction.

V.—PHYSIOLOGY.

505. KOSTER. Report on some experiments in regard to erythropsia. *Geneesk. Tydschrift*, 1899, i., p. 86.

506. GOLOWIN. Investigations on the specific gravity of the aqueous humor. *Wjest. Ophth.*, 1898, No. 6.

507. PILTZ. On attention reflexes of the pupils. *Neurol. Centralbl.*, 1899, No. 1.

508. BEER. Accommodation in animals' eyes. *Wiener klin. Wochenschr.*, 1898, No. 42.

509. SCHULTZ. On the way in which miotics and mydriatics act. *Arch. f. Physiol.*, 1898, 1–2, p. 47.

510. ABELSDORFF. Physiological observations on the eye of the crocodile. *Ibid.*, 1898, 3, p. 155.

511. MINOR, J. L. Learning to see at forty; first with one eye, and later with both. *N. Y. Med. Journ.*, Nov. 5, 1898.

GOLOWIN (506) found the average specific gravity of the aqueous humor in the rabbit to be 1.0087, in the dog, 1.0086, and in the cat, 1.0088; these figures representing approximately the specific gravity of 1 % salt solution. The aqueous humor that is secreted immediately after evacuation of the anterior chamber is of higher specific gravity. The specific gravity is also increased after the instillation of 5 % salt solution into the conjunctival sac with abrasion of the corneal epithelium. In chronic glaucoma, the specific gravity of the aqueous is not increased, but in acute glaucoma it is. HIRSCHMANN.

PILTZ'S (507) experiments on attention reflexes showed that the pupils contract more markedly when the attention is called to a light than when a light is merely placed before the person. Also, the pupils dilate more markedly when the attention is called to a dark object in the visual field than when it is indifferently regarded.

According to SCHULTZ (509), atropine paralyzes the endings of the short ciliary nerves, causing mydriasis. Cocaine dilates the pupil by excitation of the dilatator fibres, and increases the mydriasis caused by atropine. Whether cocaine mydriasis is dependent upon an action on the iris vessels is not absolutely determined. Physostigmine causes miosis by excitation of the peripheral ends of the short ciliaries. Atropine and physostigmine, therefore, are direct antagonists, acting on the same nerves in opposite ways.

ABELSDORFF (510) found the crocodile's retina very rich in cones, as is usual in night-seeing animals. The rods contain visual purple, which is clearly seen with the ophthalmoscope in eyes which have been kept in the dark. The power of regeneration of retinal purple is strong and it does not disappear even after death if the retina remains in contact with the epithelium.

This interesting case of MINOR'S (511) is that of a man of forty who was blind with cataracts from his birth. He was of remarkable intelligence and did most of the things that those with seeing eyes do, such as chop wood, maul rails, split shingles, etc., and could find his way about almost anywhere without difficulty. His instinctive estimate of direction was remarkable. He seemed to be able to tell colors by feeling. One cataract was removed and in ten days the eye was allowed to see. Almost instantly he recognized forms, such as square and round, and had a good judgement as to colors. The visual fields were normal. He

remarked that objects with which he was familiar through touch appeared about one third the size through his eyes. The other lens was successfully removed soon after and he had binocular vision which helped him in estimating distances. V R + 7 $\frac{25}{40}$ —; L + 7 $\frac{25}{30}$—. BURNETT.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

512. IWANOFF. The refraction in the first four months of infancy. Inaug. dissert., St. Petersburg. Reviewed in *Wratsch*, 1898, No. 47.

513. WEISS. The visual field of myopes. Leipsic and Vienna: F. Deuticke, 1898.

514. ASHER. Monocular and binocular visual field of a myope. *Graefe's Archiv*, xlvii., p. 318.

515. BARRETT, J. W. Do mammals accommodate? *Ophth. Review*, xvii., p. 255.

516. JACKSON. The distance between the surgeon and patient for accurate skiascopy. *Ophth. Record*, Dec., 1898.

517. RISLEY. Anisometropia. *Ibid.*

518. BRUNS. Removal of lens for high myopia. *Amer. Journ. of Ophth.*, Oct., 1898.

519. STEBBINS. Two cases of chorea due to eye strain. *Med. Record*, Nov. 9, 1898.

IWANOFF (512) examined 1000 eyes of infants by skiascopy. He found H. in 92 %, E. in 7.2 %, and M. in only 0.6 %. M. of 5.6, and 7 D was found in three infants.

According to WEISS (513), in myopes the field for white and the fields for colors are small.

ASHER (514), who has myopia of 5 D, found that his binocular field of vision was much smaller than the normal.

BARRETT and LANG had previously investigated the refraction of mammals. They never found any alteration in the refractive power of these eyes except in monkeys. Barrett (515) further describes in this paper experiments on animals—monkeys, cats, dogs, etc. A double iridectomy was done in the eye to facilitate observations, and the refraction was determined by retinoscopy before and after the stimulation of the ciliary muscle either by eserine or electricity. No alteration in the refraction was detected except in monkeys. They conclude that the power of accommodation only exists in man and monkeys. The author had a communication

from Dr. Th. Beer, who found that reptiles had an amplitude of accommodation from 13 D to 15 D; monkeys 10 D; in other animals only 1 to 3 D. WERNER.

For the accurate determination of refraction by skiascopy JACKSON (516) recommends a distance of about half a metre, if it is desired to test accurately the refraction of the "visual zone." For this he has always contended. BURNETT.

RISLEY'S (517) experience has demonstrated the wisdom of giving full corrections for each eye in every case, whether in anisometropia of the myopic or hyperopic type, or in antimetropia (one eye H. the other M.; Noyes). BURNETT.

The case reported by BRUNS (518) was a girl of twelve years. R V $= \frac{4}{200}$, with $-20 = \frac{20}{20}$; L, $\frac{5}{200}$, with -18, $\frac{20}{60}$; R lens needled, and fourteen days after two thirds of lens removed by Lippincott syringe, with a slight loss of vitreous. Iritis with hypopyon followed, with closure of pupil. Free iridotomy made which closed. Another was made, giving finally a pupil through which, with $+3 + 3$ 105° V $= \frac{20}{30}$. BURNETT.

In the first of STEBBINS'S (519) cases, a girl of nine years, very pronounced choreic symptoms were immediately stopped by $+0.75$ in R, $+0.5$ in L. When the glasses were omitted the symptoms returned.

In the second case, a boy of thirteen, there was a small degree of hyperopia with an esophoria of 7°, correction of which by glasses relieved the choreic symptoms completely.

BURNETT.

VII.—MUSCLES AND NERVES.

520. LANDOLT. The strabismus operation. *Arch. d'opht.*, xviii., 10, p. 609.

521. PRIESTLEY SMITH. On the etiology and educative treatment of convergent strabismus (Bowman lecture). *Trans. Ophth. Soc. Un. K.*, xviii.

522. HANSELL. Pseudo-external strabismus. *Amer. Journ. of Ophth.*, Dec., 1898.

523. BEARD. Recent experience with advancement of the recti muscles. *Journ. Amer. Med. Assoc.*, Oct. 8, 1898.

In a paper before the French Congress of Surgeons, LANDOLT (520) described the development and treatment of strabismus, which has been termed "*pied bot de l'œil.*" He expressed his well-known views that tenotomy of the ocular muscles was less to

the purpose than advancement, and that tenotomy, if done at all, should be undertaken only after advancement of the weak muscles had been performed. Orthopædic exercises increase the effect of operation. V. MITTELSTÄDT.

P. SMITH'S (521) interesting lecture, which occupies thirty pages, deals mainly with the value of the educative treatment of strabismus. The author studied the question himself for two years, and noted all the cases personally. The following points were noted in each case: Age of patient; age when squint began; circumstances of onset; nature of squint, periodic, continuous, alternating, or unilateral; fixation power of squinting eye; angle of squint, measured by tape. At the second visit the refraction was estimated under atropine and visual acuteness determined, and glasses prescribed. In later stages the other tests employed were the fusion sense and its limits as determined by a special instrument which is figured, and binocular vision. An analysis of 261 cases of strabismus is given and the author sums up as follows:

1. Convergent strabismus is a disorder of innervation in which the visual centres fail to control the act of convergence.

2. Failure of control depends largely on faulty development of the visual apparatus. The fault, whether it be in the eye or in the central organs, is frequently hereditary.

3. Hypermetropia, when of considerable degree, predisposes to strabismus, and sometimes causes it, by demanding an abnormal effort of control.

4. The disorder is confirmed and perpetuated by suppression of the function of the squinting eye. In treating it we should aim at stopping this habit of suppression and establishing the habit of binocular control.

In 200 cases which were re-examined, 57 had binocular vision of a certain kind; 59% of the periodic and 18% of the continuous squints had recovered binocular vision. In half of the 200 cases there was no binocular vision restored. These remarks relate to fusion only, and not to full perspective vision, which was recovered only in 16 cases.

Following Javal these methods of education were employed, viz.: occlusion of one eye; bar-reading; and the use of fusion tubes. WERNER.

In HANSELL'S (522) case there was an external strabismus which had been operated upon previously by division of the externus with some correcting effect. H. found by the use of

his cobalt glass test that there was exophoria of some 15° and also hyperphoria of from 4° to 8°. He corrected the hyperphoria by operation and with this there came a slight over-correction of the exotropia without anything being done to the externus.

BURNETT.

BEARD (523) gives statistics of 214 cases of squint, 142 of which were convergent. Of these 81 were treated by advancement, 57 of the externus, 24 of the internus. From a study of these cases he is convinced that advancement is the only proper operation for all forms of strabismus. BURNETT.

Sections VIII.–XII. Reviewed by PROF. SILEX, Berlin.

VIII.—LIDS.

524. RAEHLMANN. On disease of the lashes and lids due to mites in the hair follicles (Blepharitis acarica). *Deutsche med. Wochenschr.*, 1898, Nos. 50–51.

525. GÜNSBERG. A case of myxœdema of the lids and face unsuccessfully treated with thyroid preparations. *Wjest. Ophth.*, 1898, Nos. 4, 5.

526. ISCHREYT. A presumable case of congenital trichiasis. *Centralbl. f. pract. Augenheilk.*, xxii., p. 371.

527. QUERENGHI. On the treatment of entropium and trichiasis by horizontal linear cauterization of the lids. *Ann. d'ocul.*, cxx., p. 241.

528. PESCHEL. A new modification of the trichiasis operation. *Zehender's klin. Monatsbl.*, xxxvi., p. 426.

529. VEHMEYER. On the etiology of ectropium. *Wochenschr. f. Ther. u. Hyg. d. Auges*, ii., No. 2.

530. ADAMUECK. A few words on the so-called Jaesche-Arlt operation. *Wjest. Ophth.*, 1898, Nos. 4, 5.

531. MOTAIS. The ptosis operation. *Ann. d'ocul.*, cxx., p. 378.

532. HIRSCHBERG. The operative elevation of the upper lid after shot wounds of the temple. *Deutsche med. Wochenschr.*, 1898, No. 39.

RAEHLMANN (524) finds the demodex folliculorum, which Stieda accidentally discovered in the follicles of the eyelashes in a corpse, to be present in the lids with some frequency. The female is about 400 μ and the male 220 μ long. From the eggs

six-footed larvæ develop. The mites are found in the hair follicles only and not in the sebaceous glands. They lie deep, between the lash and the root sheath. The parasite is found in 2 per cent. of healthy eyes and in 25 per cent. of trachomatous eyes, but is absent in the usual forms of blepharitis. The use of a salve composed of balsam of Peru and lanolin brings about a cure in six or eight days.

ISCHREYT'S (526) patient, a girl of 12, suffered from trichiasis which, according to the mother's statement, was congenital.

QUERENGHI (527) believes that in the treatment of entropium and trichiasis linear cauterization is not used frequently enough, although the good results following its employment were shown long ago by Cusco and Magni.

The cauterization is performed with a thermo- or galvano-cautery in a line parallel to the lid margin and 4 *mm* from it.

SULZER.

ADAMUECK (530) calls attention to the fact that Arlt's method of operation had nothing in common with Jaesche's, but that it was a completion of Flarer's operation, Flarer's bridge of skin being transplanted instead of being removed. Arlt called the modified operation the Jaesche-Arlt, possibly because he misunderstood Barth's description, the original paper being published in Russian.

HIRSCHBERG (532) obtained good results with the Birnbacher operation in 5 cases of traumatic ptosis. The sutures should remain in three weeks.

IX.—LACHRYMAL AFFECTIONS.

533. AHLSTRÖM. On traumatic dislocation of the lachrymal gland. *Centralbl. f. p. Augenheilk.*, xxii., p. 300.

534. RISLEY. The conservative treatment of epiphora and affections of the lachrymal apparatus. *Journ. Amer. Med. Assoc.*, Oct. 1, 1898.

535. REIK. The value of large probes in the treatment of lachrymal strictures. *Ibid.*, Oct. 8, 1898.

536. BLACK. The use of large probes in stenosis of the lachrymal duct. *Ibid.*

AHLSTRÖM (533) adds a fifth to the four previously reported cases of dislocation of the lachrymal gland. The patient was

a child of twelve who in his second year had fallen on the ice, injuring the right upper lid. When examined there was well marked ptosis, caused by thickening of the upper lid, particularly near the outer canthus. A tumor was found under the skin which, on removal, proved to be the lachrymal gland in a state of chronic interstitial inflammation. The fact that all the cases of dislocation on record occurred in infancy leads the author to believe that there is then a less firm fixation of the gland than later.

RISLEY (534) pleads for a more conservative and delicate treatment of lachrymal affections. The punctum alone is often at fault in epiphora, and he has found, in some cases, an obstruction at the nasal end of the duct, the removal of which gave relief. The use of probes should be carefully made and large ones are seldom necessary. BURNETT.

In 130 cases of lachrymal stricture treated with probes ranging from No. 12 to No. 16, REIK (535) has found that about 95 % were cured; a relapse may occur in about 5 % of these.

BURNETT.

The three points BLACK (536) desires to emphasize in this paper are the opening of the upper canaliculus, the use of the largest probes possible, and the electrolytic action of the negative pole of the battery. BURNETT.

X.—ORBIT AND NEIGHBORING CAVITIES.

537. MAYER. Intermittent exophthalmus with blindness and partial paralysis of the extrinsic ocular muscles. *Zehender's klin. Monatsbl.*, xxxvi., p. 435.

538. PURTSCHER. On traumatic enophthalmus. *Arch. f. Augenheilk.*, xxxviii., 2, p. 144.

539. GOLOVINE. A plastic procedure for closing the orbit after exenteration. *Arch. d'opht.*, xviii., p. 679.

540. AHLSTRÖM. Two cases of ectasia of the ethmoid cells simulating orbital tumor. *Zehender's klin. Monatsbl.*, xxxvi., p. 375.

541. ROOSA. A case of dislocation of the eyeball produced by the fall of the branches of a decayed tree upon the face and head. Complete recovery of the injured ball. *The Post-Graduate*, Nov., 1898.

542. GOODE. A case of sarcoma of the orbit. *Amer. Journ. of Ophth.*, Dec., 1898.

MAYER'S (537) patient was a woman of thirty-seven, whose intermittent exophthalmus was supposed to be due to varicose orbital veins.

PURTSCHER (538) reports two cases of traumatic enophthalmus. One patient was struck by the horn of a cow in the region of the left eye, and the other was kicked in the forehead.

Since it was unlikely that there were cicatricial contractions in the orbit, and deformity of the orbital walls was wanting, and the normal pupil spoke against injury of the sympathetic, the author assumed in one case a trophic disturbance of the orbital tissues from injury of the nerves. In the second case there may have been fracture of the orbit.

In order to hasten the healing, prevent indrawing of the lids, and allow an artificial eye to be worn, GOLOVINE (539) implanted a skin flap in an orbit from which he had removed a sarcoma.

When granulations began to form on the bone a flap from the temple was turned in upon the outer wall of the orbit and a second flap pushed in from below and outward. After a time the pedicle of the latter flap was divided at the orbital margin. The orbit when covered with epidermis was greater than the cavity following an enucleation, but it was so similar to the latter that an artificial eye could be worn. v. MITTELSTÄDT.

In the case reported by ROOSA (541), a piece of wood coming from above, passed through the upper lid across the cornea and penetrating the floor of the orbit entered the antrum and came out in the mouth. There was much inflammation of the cornea and conjunctiva and many months of treatment with an operation on the bones of the face were necessary before the patient recovered, but this he did, with no further damage to the eye than a paralysis of the inferior rectus. BURNETT.

GOODE'S (542) case was that of a girl of eleven years, who had a small growth at the lower outer part of the left orbit not involving the eye. It was removed in May. In June there was a reappearance, and the tumor and eyeball were removed. In September there was another return, for which operative procedure was declined. Alt, who examined the growth, calls it an alveolar large round-celled sarcoma.

BURNETT.

XI.—CONJUNCTIVA.

543. SCHMIDT-RIMPLER. Some remarks on trachoma and epidemic eye diseases and on their treatment. *Deutsche med. Wochenschr.*, 1898, No. 47.

544. HOPPE. The treatment of epidemic trachoma. *Wiener med. Wochenschr*, 1898, No. 46.

545. HOPPE. Trachoma epidemics and their control in Gumbinnen. *Klin. Jahrb.*, vii., 1.

546. GÜNSBERG. On the treatment of trachomatous entropium and trichiasis. *Wjest. Ophth.*, 1898, Nos. 4, 5.

547. SAUER. On blennorrhœa neonatorum. *Inaug. Dissert.*, Bonn, 1898.

548. AXENFELD. On non-gonorrhœal blennorrhœa of the conjunctiva. *Deutsche med. Wochenschr.*, 1898, No. 44.

549. TAMAMCHEF. Conjunctivitis diphtheritica seu necrotica. Ocular diphtheria treated with iodoform. *Centralbl. f. Augenheilk.*, xxii., pp. 321 and 362.

550. MICHEL. A contribution to the bacteriological study of phlyctenular ophthalmia. *Ann. d'ocul.*, cxx., p. 257.

551. VIGNES. Soft chancre of the bulbar conjunctiva. *Ann. d'ocul.*, cxx., p. 284.

552. SPIRO. A case of conjunctival hemorrhage in purpura hemorrhagica. *Centralbl. f. p. Augenheilk.*, xxii., p. 375.

553. SOURDILLE. Congenital serous cyst (cystic lymphangioma) of the bulbar conjunctiva. *Arch. d'opht.*, xviii., 11, p. 673.

554. STEPHENSON, SYDNEY. On epithelial xerosis of the conjunctiva. *Trans. Ophth. Soc. United Kingdom*, xvii., p. 55.

555. HOTZ. On the use of epithelial grafts for replacing the ocular conjunctiva. *Jour. Amer. Med. Assoc.*, Oct. 1, 1898.

556. GILFILLAN. The prevention and treatment of trachoma at the House of Refuge. *N. Y. Med. Jour.*, Oct. 29, 1898.

SCHMIDT-RIMPLER (543) calls attention to the insufficient inspection of candidates for military service who suffer from eye diseases. He has used the Scott method of treating pannus, as it is employed in Cairo, with success. In Egypt he found about 80 per cent. of trachomatous persons. The infection seems to be carried by flies. In Cairo and in Constantinople he found usually only cicatricial trachoma.

HOPPE (544) recommends the establishment of dispensaries as well as hospitals in regions in which trachoma is prevalent. He uses Knapp's roller forceps.

The purposes of a satisfactory entropium-trichiasis operation are to remove the curvature of the tarsus, to supply a new intermarginal space when possible, to weaken the orbicularis, and to fix the skin of the lid so that it cannot glide over the anterior surface of the tarsus. GÜNSBERG (546) believes that the simplified operation of Panas meets these demands.

It is performed as follows: Knapp's lid clamp is applied, an incision is made 4 *mm* from the lid margin and parallel to it, a section of muscle 2–3 *mm* broad is removed and the tarsus exposed; the latter with the conjunctiva is then cut through. Sutures with two needles are then introduced, 3 *mm* apart, into the skin of the upper margin of the wound, then deep into the cartilage and out at the upper margin of the tarsal wound, then into the lower portion of the tarsus 1–1½ *mm* below the cut edge, passing through its entire thickness and emerging on the mucous side, where they are tied. HIRSCHMANN.

AXENFELD (548) reminds his readers that there are various forms of gonorrhœa of the conjunctiva with and without gonococci. Gram's stain is necessary to distinguish true gonococci from pseudo-gonococci and possibly from pneumococci. In two cases Axenfeld found a blennorrhœa to be due to bacteria of the group bacterium coli commune, and in one new-born infant a double diphtheria of the conjunctiva was due to virulent Loeffler bacilli but passed off after antitoxin injections.

Among 10,000 cases of eye disease TAMAMCHEF (549) saw 9 cases of true diphtheria of the conjunctiva. He suggests instead of diphtheritic and croupous the terms conjunctivitis necrotica and fibrinosa; in the former condition the cornea sloughs rapidly, while in the latter it is not affected. It is not fully decided whether the Loeffler bacillus is the sole cause of the necrotic form. Ordinary methods of treatment are of little avail but the author preserved the cornea in every case by washing out the conjunctival sac with formalin solution, 1–2000 or 1–500, and then sprinkling in finely powdered iodoform and keeping the eye bandaged for twenty-four hours. This procedure was repeated daily for a time.

In a careful investigation concerning the etiology of phlyctenular inflammation MICHEL (550) comes to the following conclu-

sions: 1. Phlyctenular inflammation is of parasitic origin but individual disposition is of importance. 2. The phlyctenula is a reaction sign without specific character; inoculation experiments on rabbits showing that while the staphylococci are the most frequent cause of the disease various other cocci and bacilli may cause it. SULZER.

VIGNES'S (551) patient, a man of fifty, exhibited symptoms of a severe purulent inflammation of the left eye. No gonococci were found, but on the conjunctiva of the upper lid was a deep purulently infiltrated ulcer. At the time, the patient was dressing a suppurating bubo which had been caused by a soft chancre. Unfortunately a thorough bacteriological examination was not made. SULZER.

SPIRO (552) presented a case of conjunctival hemorrhage in purpura hemorrhagica. A child of three, after recovering from an attack of measles thirteen weeks before, began to bleed from the left conjunctiva. When examined, numerous hemorrhages were discovered in other parts of the body. There was complete recovery in a month.

SOURDILLE (553) observed a thin-walled bluish cyst beneath the conjunctiva of a laborer, aged twenty-seven. The cyst, which for a time remained small, grew rapidly for two months, attaining a size of 25 x 12 *mm.*

The contents of the cyst were clear and after removal the wall was found to be composed of a lining of polygonal cells, a thin fibrous layer, and a connective-tissue layer with vessels which passed over into the normal tissues. The author concluded that this was a congenital lymph cyst of the sort found in the axilla and in the neck. v. MITTELSTÄDT.

STEPHENSON (554) contributes a very exhaustive and original paper of forty pages on epithelial xerosis as distinguished from the parenchymatous form. He examined 6209 school children and found that 1.87 % had xerosis. A very detailed description of the disease is given, but we can only mention the more important or original points. The xerosis patches do not stain with fluorescine; methylene blue and some other basic aniline dyes stain them a little. The silvery scales are reproduced within twenty-four hours after complete removal. There is no local anæsthesia. In all cases the typical bacilli were found. They were best shown by Gram's process with eosine as counter stain, and have no capsule or flagella. They develop colonies *within sixteen hours* on

serum or blood agar. The microscope alone could not differentiate them from the diphtheria bacillus. Milk is a good nutrient medium, potato not. He sometimes found them in the normal conjunctival sac, and in the white foam which collects on the lids in some cases of conjunctivitis. Attempts to inoculate the conjunctiva failed as with previous writers. The author asks if they might not succeed in individuals after wasting illnesses. The next question discussed is the relation between xerosis and hemeralopia; Stephenson found the proportion to vary at different times and places, but their connection is very close.

In cases of epithelial xerosis without night blindness the author found a shrinking of the field for red and green, the red field lying inside or overlapping the green, and less constantly slight contraction of the white field. These disappear with the disappearance of the xerosis. The changes in the visual fields are more marked when hemeralopia is present. Ophthalmoscopically the only point noticed was exaggeration of the retinal reflexes. The views of previous writers as to the cause of this disease are next considered and may be reduced to two, namely: first, lowered nutrition; and second, dazzling. The author has only met with the disease in spring and summer when the glare on the white-washed walls and flagged yards in the schools was at its greatest, but of the two factors he considers lowered nutrition the more important. In a majority of the author's patients there was evidence of scrofula, and an investigation of the blood showed a marked deficiency of hæmoglobin (65 % of the normal) in every case, which diminished with the disappearance of the xerosis. Iron sometimes exerts an almost specific influence upon the disease; cod liver oil is not a speedy remedy. The paper concludes with sixty-seven references to previous literature and a table showing results of estimation of hæmoglobin in 164 *healthy* children.

In the course of the subsequent discussion Dr. Eyre stated that he had made inoculations of the xerosis bacillus in animals whose resistance had been lowered by the previous injection of toxines, but had never had positive results.

L. Werner.

Hotz (555) reports a case in which he used epithelial grafts from the lips, cut after the manner recommended by Gifford, to replace the conjunctiva after the removal of an epithelioma of that tissue. The size of the graft used was 1.5 *cm* by 0.5 *cm*. He

used a suture above and below. The graft was found firmly adhered at the end of the second day. BURNETT.

Out of a total of 800 inmates of the House of Refuge, GILFILLAN (556) found 325 affected with trachoma. The further spread of the disease was prevented by thorough isolation. In the early stages he uses expression, followed generally with sulphate of copper crystal. In the chronic forms he has found the copper crystal most efficacious. BURNETT.

XII.—CORNEA, SCLERA, AND ANTERIOR CHAMBER.

557. v. HIPPEL. The anatomical findings in purulent keratitis in man. *Graefe's Archiv*, xlvii., p. 156.

558 LESSHAFT. On the treatment of ulcus serpens corneæ. *Zehender's klin. Monatsbl.*, xxxvi., p. 358.

559. SASSAPAREL. The treatment of chronic keratitis and conjunctivitis by massage with an ointment containing bichloride of mercury and cocaine.

560. SAEMISCH. A case of scabies of the cornea. *Zehender's klin. Monatsbl.*, xxxvi., p. 449.

561. PESCHEL. A case of epithelioma of the corneal limbus removed with recurrence after thirteen years. *Ibid.*, p. 368.

562. PROKOPENKO. A movable foreign body in the anterior chamber. *Wjest. Ophth.*, 1898, 4, 5.

563. BAUMANN. On keratoconus. *Inaug. Dissert.*, Erlangen, 1898.

564. GRADLE. Traumatic recurrent keratitis, keratalgia, and ciliary neuroses. *Annals of Ophth.*, Oct., 1898.

565. KINNEY. A case of severe ulcerative keratitis successfully treated with nosophen after other remedies had failed. *The Post-Graduate*, Nov., 1898.

566. COX. Papilloma of the corneo-scleral margin with report of a case. *Ibid.*

v. HIPPEL (557) reports on a bilateral kerato-malacia with pneumococci, in an infant with hereditary syphilis, and on the anatomical findings in neuroparalytic keratitis. In the latter case there was a true hypopyon keratitis, whose origin was doubtless due to micro-organisms. The beginning of the process seemed to him to be the dessication, the inoculation occurring later.

LESSHAFT (558), in serpent ulcer, whether there is evident dacryocystitis or not, treats the lachrymal sac by passing probes and by irrigating. The cornea is first subjected to a conservative antiseptic treatment, and if this is not successful the galvanocautery is used or Saemisch's operation is employed. He attaches great value to warm, moist, iodoform-bichloride dressings.

SASSAPAREL (559) recommends a salve consisting of 1–500 bichloride solution, one drop; cocaine, 0.10; and vaselin, 4.00; for massaging phlyctenular processes of the cornea and conjunctiva and chronic conjunctival catarrhs. KRAHNSTÖVER.

In SAEMISCH'S (560) case there appeared to be an ordinary fascicular keratitis. After using red precipitate ointment the eye became much irritated and a grayish-white mass appeared at the seat of the infiltration. When examined with the microscope a well-preserved female acarus scabiei was found with eight eggs near it.

PROKOPENKO'S (562) patient had a movable body that seemed to be a chip of coal, in the anterior chamber. The eye being free from irritation no operative treatment was undertaken.

HIRSCHMANN.

BAUMANN (563) reports a case of keratoconus with threatened perforation. After being cauterized three times the cornea resumed it natural curvature, and there remained a dense sharply-outlined scar 3 *mm* in diameter.

GRADLE (564) has observed a number of cases of recurrent corneal affections following slight injuries to the corneal surface. He has never seen them follow deep wounds. The first of these classes is the persistence of a grayish opacity which was associated with periodic and easily induced attacks of ciliary injection. He has seen them last for two years and then finally disappear, showing that they were not scar tissue. In another class of cases the lighting up is in the form of a genuine keratitis. These may occur from months to years after the original injury. In the treatment of these cases he has found antipyrine the best analgesic, and calomel locally to exercise a good influence. In obstinate cases the actual cautery has promptly cured them.

In still another different form there are pain and ciliary injection without visible corneal lesion, beginning sometimes long subsequent to the original injury. One case he gives in great detail in which it recurred at intervals of from one week to five for thirteen years. In those cases of keratalgia he is inclined to

assume some injury to the terminal filament of the nerve as a cause. BURNETT.

In the case reported by KINNEY (565) a very extensive creeping ulcer of the cornea with hypopyon, which had resisted all forms of medication, began to improve at once on the local application of nosophen. He has found the drug useful in other cases of less virulence. BURNETT.

COX's (566) patient was a man of fifty. There was a soft, pinkish, elastic tumor with mammillated surface, at the lower corneo-scleral margin extending up to the edge of the pupil. It was 1 *cm* in diameter. It was removed twice and recurred in a short time on each occasion. The third time the base was thoroughly scraped and nitric acid applied. It did not return. The microscope showed a papillomatous structure.

BURNETT.

Sections XIII.–XVIII. Reviewed by DR. O. BRECHT, Berlin.

XIII.—LENS.

567. SCHMIDT-RIMPLER. On spontaneous resorption of opacities of the lens. *Berl. klin. Wochenschr.*, 1898, No. 44.

568. MADER. Further contributions to the final result of reclination. *Wiener klin. Wochenschr.*, 1898, No. 50.

569. PLEY, EUGENE. On a procedure for the extraction of secondary cataract. *Thèse de Paris*, 1898.

570. BURNETT. On some changes in visual sensations after cataract extraction, and especially blue vision (kyanopsia). *Ophth. Record*, 1898, vii., p. 17.

571. VALK. Cataract extraction, Valk's operation. *Ibid.*, p. 289.

572. BATTEN. Symmetrical congenital lenticular opacities. *Trans. Ophth. Soc. Un. King.*, xviii., p. 105.

573. BICKERTON. Congenital displacement of lenses, spontaneous dislocation into the anterior chamber, replacement into the vitreous by operation, recovery of perfect vision. *Ibid.*, p. 118.

574. PECK. Traumatic cataract in an infant's eye from pressure of the forceps. *Med. News*, Nov. 26, 1898.

575. MITCHELL, S. Fragment of steel in the crystalline lens. *Ophth. Record*, Nov., 1898.

SCHMIDT-RIMPLER (567) reports two cases of spontaneous absorption of senile cataract, and adds some remarks on the clearing up of senile, diabetic, and traumatic opacities of the lens, and concludes with a description of experiments on rabbits' eyes in regard to cataract, new formation of the lens, and corneal opacity.

MADER (568) collected reports of thirty-nine eyes in which reclination had been done. Most of the eyes were blind, and those that still retained useful vision presented symptoms which suggested a final disastrous outcome.

In the case reported by PECK (574), the right eye of an infant was pressed upon by forceps during delivery, causing a severe traumatism, a decrease of tension, and a traumatic cataract. The cataract was absorbed, and at the age of seven years and a half vision in the eye was $\frac{20}{70}$ and with + 1. D $\frac{20}{20}$. There was a slight divergent strabismus. BURNETT.

MITCHELL (575) reports two cases of bits of steel in the lens, which had entered the eye through the cornea and pupil, leaving the iris intact. Both were successfully removed by the magnet having a lifting power of one ounce. One was 7 *mm*, the other 3 *mm* long. Both eyes recovered nicely. BURNETT.

XIV—IRIS.

576. GROENOUW. A case of unpigmented alveolar flat sarcoma of the ciliary body, with remarks on the presence of epithelioid cells in and on the retina in glaucoma. *Graefe's Archiv*, xlvii., p. 282.

577. GROENOUW. On sarcoma of the ciliary body and its relations to sarcoma elsewhere in the uveal tract. *Ibid.*, p. 398.

578. ANDREWS. Congenital absence of the iris. *Ophth. Record*, Nov., 1898.

579. ALT. Note on the pigmented globular excrescences of the iris of the horse. *Am. Jour. of Ophth.*, Dec., 1898.

580. ALT. Adenoma of the ciliary body arising from the pars ciliaris retinæ. Four cases. *Ibid.*, 1898, p. 321.

GROENOUW'S (576) case was one of primary, flat, unpigmented, alveolar sarcoma in a man of twenty-eight. It involved half of the ciliary body and had given rise to two secondary epibulbar tumors of similar structure. There was secondary glaucoma. Above and beneath the limitans interna were polygonal epithe-

lioid cells, some having processes. Groenouw was inclined to believe these cells to be of inflammatory origin and not sarcomatous.

GROENOUW (577) collected fifty cases of sarcoma of the ciliary body from the literature. Ninety per cent. were pigmented, ten per cent. unpigmented. Spindle-celled sarcoma was most frequent, mixed-celled next, and round-celled rarest. The average age of patients with spindle-celled sarcoma was forty-four, of patients with round-celled thirty-five; the latter being of more rapid growth and more malignant. The patients with unpigmented sarcoma were, as a rule, younger than those with pigmented. The prognosis is better in sarcoma of the ciliary body than in sarcoma of the choroid (12 per cent. of cures in the former), probably because it is recognized and operated on earlier.

The two cases of congenital absence of the iris reported by ANDREWS (578) occurred in a mother and infant daughter. In the mother there was also upward dislocation of both lenses, which were more or less opaque. A discission was made on the right lens, which was followed by glaucoma. For this an anterior sclerotomy was done and pilocarpine instilled. She recovered with V = $\frac{15}{50}$ with + 12. A general consideration of irideremia followed. BURNETT.

ALT (579) examined the pigmented nodule found on the pupillary edge of the iris of the horse. It has a glandular appearance, and, the author thinks, may be similar to the benign adenomata he has described as found on the ciliary processes of the human eye. BURNETT.

ALT (580) describes and pictures a form of tumor of the ciliary processes which he has found in four eyes. Of three of these eyes he had no previous history. The fourth was enucleated for sarcoma of the conjunctiva. All the tumors had the characteristics of adenoma. Their origin is doubtful. BURNETT.

XV—CHOROID.

581. ROTHENPIELER. Secondary cyclitis, arising by way of the lymph current. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 304.

582. DELBÉS. A case of death after enucleation for panophthalmitis. *Clin. opht.*, 1898, No. 14.

583. STRZEMINSKI. A case of essential ophthalmomalacia. *Graefe's Archiv*, xlvii., p. 420.

584. MARSHALL. Some points connected with sarcomata of the choroid and gumma of the conjunctiva. *Ophth. Record*, Dec., 1898.

ROTHENPIELER'S (581) patient developed a severe cyclitis in the course of an inguinal bubo from a phagadenic soft chancre. Both cyclitis and bubo recurred simultaneously. Eventual recovery.

STRZEMINSKI (583) adds a new case to the seventeen already recorded of essential ophthalmomalacia. In this case he observed four attacks of hypotony all ending in recovery. He believes the cervical sympathetic to be more at fault than the trigeminus in this vasomotor neurosis.

One case of sarcoma of the choroid reported by MARSHALL (584) was found in an old atrophic eye which had been lost from injury thirty-six years before. The first sign of irritation appeared eighteen months before enucleation. A bony degeneration of the choroid was also present nearly filling the globe. The tumor had extended beyond the globe at the optic-nerve entrance. The other case was also in a degenerated eye whose vision had been lost for twenty years.

The case of gumma of the conjunctiva was in an old man whose eye was lost through hemorrhagic retinitis and glaucoma. There was an enormous thickening of the conjunctiva around the cornea and extending some distance back. The eye was removed and the growth found to have a gummatous nature.

BURNETT.

XVI.—VITREOUS.

585. MCGILLIVRAY. The hyaloid artery and its relations to cyclitic exudation. *The Scottish Med. and Surg. Jour.*, Oct., 1898.

MCGILLIVRAY (585) describes and illustrates a case showing that cyclitic exudation may fill the patellary fossa, hyaloid canal, and its expansion at the optic disc, the area Martegiani. It is a pathological demonstration of the patency of the hyaloid canal.

WERNER.

XVII.—GLAUCOMA.

586. TROUSSEAU. Glaucoma and ophthalmic migraine. *Ann. d'ocul.*, CXX., p. 253.

587. ANGELUCCI. Disturbances in the function of the vessels in buphthalmus and the value of surgical procedures. *Ophth. Klinik*, 1898, 3, p. 44.

588. ROGMANN. Some considerations on operative intervention in the treatment of simple chronic glaucoma. Extract from *La Belgique médicale.*

589. ASCHHEIM. The transfixion of the iris. *Arch. f. Augenheilk.*, xxxvii., p. 117.

590. HARLAN. A case of hereditary glaucoma. *Jour. Am. Med. Assoc.*, Oct. 8, 1898.

591. ALT, SHOEMAKER, and JENNINGS. Another case of hemorrhagic glaucoma with a clinical diagnosis of previous thrombosis of the central retinal vein. *Am. Jour. of Ophth.*, Oct., 1898.

TROUSSEAU (586) gives the history of a case in which short attacks of glaucoma with subjective light sensations and pain were mistaken for attacks of ophthalmic migraine, since between the attacks the affected eye (one eye having been blind from infancy) was entirely normal. Fortunately the patient was once examined in the course of an attack when the marked increase in tension, the episcleral injection, and the characteristic cloudiness of the media left no doubt as to the diagnosis even though the pupil was normal. SULZER.

ROGMANN (588) collects all the recent views in regard to the treatment of glaucoma and recommends iridectomy.

ASCHHEIM (589) reports on eighteen eyes in which transfixion of the iris was made. The operation replaces iridectomy in cases of *iris bombé*, being easier to perform and not leaving a coloboma. Since a favorable result was noted in fifteen of the cases the author feels justified in commending the operation.

HARLAN (590) gives the history of a case of glaucoma which is in the fifth successive generation suffering from the same affection. The family is of French Huguenot stock. The case yielded readily to iridectomy. BURNETT.

The clinical history of this case by SHOEMAKER and JENNINGS (591) shows a case of thrombosis of the central retinal vein of the left eye, followed some weeks later by a secondary hemorrhagic glaucoma for which the eye was enucleated. The microscopical examination was made by ALT. The chief point of interest brought out by this was the wide-spread, almost total peri-arteritis, and a thrombosis of some branches of the central retinal vein

within the retina. The whole vascular system of the eye seemed to be in a pathological state. In a former case examined by him and reported, the vascular change was confined almost wholly to the veins. BURNETT.

XVIII.—SYMPATHETIC OPHTHALMIA.

592. MOLL. Experimental bacteriological studies on sympathetic ophthalmia. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 353.

593. HANSSEN. On injuries of the ciliary body and their relation to sympathetic ophthalmia. *Inaug. Dissert.*, Kiel, 1898.

In rabbits whose blood was infected with the bacillus pyocyaneus, MOLL (592) was able, after irritating one eye, to cultivate the bacillus from the aqueous humor of both eyes, while in control animals, whose eyes had not been irritated, the aqueous humor remained sterile. The author, therefore, agrees with Schmidt-Rimpler, Bach, and Panas, in believing that irritation of one eye causes a disposition to sympathetic ophthalmia in the second eye, and this appears if there are in the circulation injurious matters of bacterial or chemical nature.

Sections XIX.–XXII. Reviewed by PROF. GREEFF, Berlin.

XIX—RETINA AND FUNCTIONAL DISTURBANCES.

594. HIRSCHBERG. Acute hypotony as opposed to acute hypertony of the eyeball. *Centralbl. f. Augenheilk.*, xxii., p. 207.

595. SCHNORR. On retinitis circinata. *Inaug. Dissert.*, Berlin 1898.

596. GOLDZIEHER. On a hitherto undescribed ophthalmoscopic appearance (interstitial fibromatous degeneration of the retina). *Pester med.-chir. Presse*, No. 49, 1898.

597. HAMMAR and ÖHRWALL. Examination of the retina in a case of partial macropsia. *Upsala läkereförenings Förhandlinger*, 1898, iii., 7.

598. AMMANN. The retinal hemorrhages due to diseases of the blood and vessels. *Beiträge z. Augenheilk.*, 1898, 33.

599. FLEMMING. A case of retinitis proliferans in which the eye was examined after death. *Trans. Ophth. Soc. Un. K.*, xviii., p. 154.

600. LAWSON and SUTHERLAND. A case of albuminuric retinitis in a child aged twelve years. *Ibid.*, p. 140.

601. ROCKLIFFE. Pseudoglioma. *Ibid.*, p. 139.

602. ROCKLIFFE. Cystic degeneration of the retina. *Ibid.*, p. 165.

603. DAVIS. Report of recovery of a case of hemorrhagic albuminuric retinitis. Remarks as to ætiology and pathology. *The Post-Graduate*, Nov., 1898.

604. ZIMMERMAN. Some cases of toxic amblyopia, three of which show partial reversal of the color fields. *Annals of Ophth.*, Oct., 1898.

605. LAUTENBACH. Some results in cases of tobacco amblyopia. *Jour. Am. Med. Assoc.*, Oct. 1, 1898.

606. ELLETT. Some severe cases of tobacco and quinine amblyopia. *Ibid.*

607. HOLDEN. Pathological report on the eyes of Dr. Hirsch's patient with amaurotic family idiocy. *Jour. of Nervous and Mental Disease*, July, 1898.

608. DE SCHWEINITZ. Symmetrical changes at the macula following iritis probably due to degeneration of the retinal ganglion cells. *Ophth. Record*, Nov., 1898.

609. BALL. A case of quinine amblyopia. *Ibid.*, Oct., 1898.

610. BRUNER. Ring scotoma with night blindness. *Ibid.*, Nov., 1898.

SCHNORR (595) collects all the reported cases of retinitis circinata, and adds a new case observed by Greeff in a woman of sixty. The white ring about the macula was complete.

GOLDZIEHER'S (596) patient was a woman of twenty-three who had been blind for three years in the right eye, while the sight of the left eye had failed recently. By lateral illumination one saw behind the right lens the degenerated retina which was divided by numerous folds into several prominent elevations. On the surface were many new-formed vessels. In the left eye through the clear media the disc was seen to be greatly swollen and of greenish hue, as was the surrounding retina. The vessels were greatly enlarged. There were many folds and elevations in the retina, but no detachment.

The recently deceased physiologist, Paul Halmgren, suffered from 1880 with central macropsia and metamorphopsia of the right

eye due to hemorrhages and lustrous spots in the macula. He had described his subjective symptoms, and requested that the eye be examined microscopically after his death, which has just been done by Professor HAMMAR (597). The results were as follows: In the outer nuclear layer and in Henle's fibre-layer near the macula were many hemorrhagic cysts and small fresh hemorrhages. About the fovea and below it were found changes in the cones, possibly due to their crowding together. Above the fovea the cones were entirely destroyed. ÖHRWALL adds some remarks in which he attributes the macropsia to the crowding together of the cones. DALÉN.

AMMANN'S (598) paper is interesting both to the oculist and to the practitioner of internal medicine. He divides hemorrhages into those due to diapedesis and those due to rupture, the latter mostly being of traumatic origin, and rarely, also, following strained muscular efforts. From Haab's practice and the records of the Zurich clinic comprising notes of 60,000 patients he collects 90 cases which he tabulates as follows:

1.	Senility	57
	a. Retinal hemorrhages in general	13
	b. Macular hemorrhages	11
	c. Venous thrombosis	33
2.	Lues	1
3.	Alcohol and tobacco amblyopia	7
4.	Scorbutus	1
5.	Spontaneous and recurrent hemorrhages in the adolescent	10
6.	Anæmia	8

ZIMMERMAN (604) reports the histories of 6 cases of combined tobacco and alcohol amblyopia. There was always a central—peri- or para-scotoma for red and green, and some slight contraction of the field for form. In three cases there was a partial reversal of the normal order in which the colors are perceived at the periphery of the field. The main treatment is abrupt cessation of the poisons. Sweating, strychnia, mercury, and iodides are also useful. BURNETT.

LAUTENBACH (605) is of the opinion that slighter forms of tobacco amblyopia are much more common than is generally suspected. The use of tobacco in other forms than smoking does not, he believes, produce amblyopia. It also affects particularly

the young, most of the cases he has seen being under twenty-one years. Besides the iodides and strychnia, he has found hot plunge baths very beneficial in treatment. The histories of 6 cases are given. BURNETT.

In the case of quinine amblyopia, which is the one of chief interest of those reported by ELLETT (606), the patient, a man of thirty, took 120 grains in the course of 12 hours. It was 4 days afterwards that he noted failure of sight, which in a few hours was reduced to perception of light. In 3 months he regained V equal to $\frac{6}{200}$ in R, and $\frac{6}{200}$ in left, at which it remains. There is a relative ring scotoma in one eye and a positive central scotoma in the other. The nerve is white and the retinal vessels attenuated. BURNETT.

In this case of amaurotic family idiocy or Tay's disease there was in life the usual whitish patch about each macula and the optic discs were pale. HOLDEN (607) found a degeneration of all the ganglion cells in the retina, characterized by alteration in composition and great swelling—the same changes being found in all the ganglion cells of the brain and cord by Dr. Hirsch. The whitish patch occupied that portion of the retina in which the layer of swollen and opaque ganglion cells was three or more cells deep and gradually faded away a disc-diameter from the fovea where the ganglion-cell layer becomes thinner. The atrophy of the optic nerves is to be regarded as a degeneration of the axis-cylinders which arise from the affected ganglion cells in the retina.

DE SCHWEINITZ (608) gives the history with a picture of a peculiar degeneration at the macula in both eyes, the one following the other at a period of a year. He at first thought these spots might be due to hemorrhage, but he is now convinced that they are due to changes in the ganglion cells of the retina.

BURNETT.

In BALL'S (609) case a man of sixty-one took 60 grs. of quinine in 12 hours. The next morning he was totally blind and very deaf. On the third day, when seen by Ball, the pupils were dilated. V. p. l. in R, fingers at four inches in L; Tn. Retinal arteries and veins remarkably contracted, optic disc pale. No treatment. In about a year V with correction of ametropia $\frac{20}{30}$ in R, $\frac{20}{20}$ in left. Fields are given showing the amount of contraction, two weeks, thirty-six days, and a year after the attack.

BURNETT.

In the case reported by BRUNER (610) there was a small ring scotoma symmetrical from above down and out, of 10° at its widest part, and leaving a free centre of about 10°. It is in all probability congenital. Vision is somewhat reduced and there is great difficulty in reading. There is no change in the fundus to which the phenomenon can be attributed. There was also a complaint of night blindness which was considered congenital also.

BURNETT.

XX.—OPTIC NERVE.

611. KLOPPER. Optic neuritis in consequence of heredity and congenital disposition. *Inaug. Dissert.*, Tübingen, 1898.

612. GINSBERG. A case of recurrent retro-bulbar neuritis. *Wjest. Ophth.*, xv., 1, p. 32.

613. ROCHON-DUVIGNEAUD, and STANCULEANU. Contribution to the study of lesions of the optic nerve as determined by intracranial neoplasims. *Arch. d' opht.*, xviii., 10, p. 615.

614. DEYL. A new explanation of the development of œdematous optic neuritis. *Ophth. Klin.*, ii., 2, p. 27.

615. SANTOS FERNANDEZ. Differential diagnosis between malarial and quinine amaurosis. *Jour. of Eye, Ear, and Throat Diseases*, iii., 1, p. 1.

Leber first described the form of optic-nerve disease that comes on with a central scotoma affecting the male members of a family about the age of puberty. KLOPPER (611) records the history of such a family in which several male members were affected. There was no tuberculosis in the family and no symptoms of other nervous disease. The parents, however, were related.

In a case of cerebellar tubercle, in which ROCHON-DUVIGNEAUD and STANCULEANU (613) found marked choked discs and later slight atrophy of the discs with complete blindness, a considerable quantity of liquid was found in the ventricles, particularly the third, but there was only a moderate distension of the optic-nerve sheath from subarachnoid œdema. The optic nerve exhibited an atrophy increasing toward the brain, the axis-cylinders being broken down. The authors discuss the various theories of choked disc and incline to Parinaud's view, who regards the œdema of the sheaths as a continuation of the œdema of the brain, which may disappear with the latter. It

seems to the authors to be superfluous to assume a special toxic action of the œdema as the cause of the changes in the nerve, since every œdema, even in other parts of the body, is in a sense toxic, *i.e.*, it may interfere with nutrition. The disturbances seem to take place first in the axis-cylinders, these being greatly changed or even absent when the myelin sheaths are still present. The atrophy was only moderate and appeared to be only beginning, although there was complete amaurosis. Since the atrophy advanced from the intra-cranial toward the intra-orbital portion of the nerve it is to be considered a descending atrophy.

V. MITTELSTÄDT.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

616. STEINDORFF. The isolated, direct injuries of the optic nerve within the orbit. *Inaug. Dissert.*, Halle, 1898.

617. HÜME. On injuries of the eye from kicks. *Inaug. Dissert.*, Leipsic, 1898.

618. CZERMAK. Contusions of the eyeball. *Sitzungsber.*, *Prager med. Wochenschr.*, 1898, p. 604.

619. BARCK. A case of avulsio bulbi. *Amer. Jour. of Ophth.*, Dec., 1898.

620. ROTHENPIELER. Luxatio bulbi. *Beiträge zür Augenheilk.*, 31, p. 1.

STEINDORFF (616) describes in detail the clinical picture of isolated direct injury of the optic nerve, abstracts the cases already reported, and adds seven new case histories from Hippel's clinic in Halle. Microscopic examinations were made in the cases that were fatal. The writer concludes, with Wagenmann, that the secondary pigmentation of the retina after lesions of the optic nerve depends upon simultaneous injury of the ciliary vessels.

HÜME (617) describes five cases in which the eye was injured by a kick. The direction of the injury is usually from below upward, and usually the skull is fractured and the margin of the orbit is crushed. The eye is usually lost from internal injuries.

CZERMAK (618) presented three cases of contusion of the eyeball. In two the sclera had been ruptured far back and not in the zone lying between the cornea and the attachment of the muscles, the usual seat of rupture. In both there was some

exophthalmus, the anterior chambers were deep, the irides were tremulous, the balls were soft, and there were extravasations of blood in the lids and bulbar conjunctiva. In the third case, the cornea was burst by a blow, and the lens with ruptured capsule was dislocated into the anterior chamber. HERRNHEISER.

In BARCK'S (619) case a man was thrown from a wagon face downwards on some stones. He was not rendered unconscious, but when he regained his feet he found his left eye lying on his cheek. The physicians who saw him soon after found the globe attached to the orbit only by the superior rectus, which was clipped off and the globe fell off. The optic nerve enclosed in its sheath was twenty-three *mm.* long, and there were some ciliary nerves attached to the ball. The length of the remaining tendons was from seven to eight *mm.* The conjunctiva of the lid was not much distended, and the eye looked clean as after an enucleation. The lids did not seem to be injured, but there was a fracture of the right nasal bone and a complete severance of the ala nasi. BURNETT.

ROTHENPIELER (620) collects the literature of the luxation of the eyeball and considers the various theories that have been offered to account for its production. He adds a case of his own in which a man was struck with a shovel. The right eyeball lay in the palpebral fissure about two *cm* anterior to a plane corresponding to the margins of the orbit. An attempt to replace the ball, in narcosis, was unsuccessful, and the pain was so great that enucleation was done.

XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

621. PETERS. Headache from ocular disturbance. *Sammlung zwangloser Abhandlungen*, Halle, C. Marhold.

622. BOAS. The eye symptoms of tabes and of multiple sclerosis. *Zwangloser Abhandlungen*, Vossius, ed., Halle, C. Marhold, 1898.

623. JACOVIDÉS. A case of alternating and intermittent hysterical mydriasis. *Arch. d' opht.*, xviii., 10, p. 645.

624. JEAUSELINE and MORAX. Ocular manifestation of lepra. *Ann. d' ocul.*, CXX., p. 321.

625. GALEZOWSKI. Ocular accidents due to influenza. *Rec. a' opht.*, 1898, p. 673.

626. DIANOUX. Ocular disturbances observed in diabetes. *Ann. d' ocul.*, CXX., p. 248.

627. KLAUS. On conjugate deviation of the eyes in brain diseases. Marburg, Elwert'sche Buchhandlung, 1898.

628. KUNZ. On tuberculosis of the eye and its adnexa. *Inaug. Diss.*, Marburg, 1898.

629. EICHHORST. Some remarks on intermittent reflex iridoplegia in tabes. *Deutsch. med. Wochenschr.*, 1898, p. 357.

630. AXENFELD. On the ocular complications, particularly purulent inflammation of the ball, in suppurative cerebro-spinal meningitis.

PETERS' (621) treatise is very readable. The sensory branch of the fifth nerve supplies not only the eye and its adnexa but also, by means of the recurrent branch, the dura mater and, through the supraorbital nerve, a great portion of the skin of the head. In cases of eye strain either the nerves supplying the dura are affected, giving rise to true headache, or a supraorbital neuralgia is brought about.

BOAS (622) presents in a clear manner the eye symptoms of tabes and of disseminate sclerosis, and his treatise will be of value to the general practitioner, for these eye symptoms are often early and on their recognition may depend the diagnosis.

In a hysterical woman of twenty-six, with right hemianæsthesia, JACOVIDÉS (623) observed a dilatation and complete absence of reflexes in the right pupil, lasting two months, and a recurrent dilatation of the left, alternating with the right, lasting a few hours. In both eyes there was amblyopia with contraction and reversal of the color fields. Under hypnotic treatment the conditions were restored nearly to the normal. The hemianæsthesia shifted with the dilatation of the pupil. V. MITTELSTÄDT.

Clinical observation and the microscopic examination of a number of leprous eyes lead JEAUSELINE and MORAX (624) to speak of the different reactions which may be produced by the same pathogenic micro-organism. Comparisons of ocular lepra with syphilitic and tuberculous affections show, also, that the same anatomical changes may be brought about by entirely different micro-organisms. The microscope shows that the lepra and the tubercle bacilli cause the same sort of interstitial keratitis that is found in hereditary syphilis. The fact that different sorts of infection may produce like pathological reactions (whose clini-

cal course, however, varies with the cause) should lead us to discard pathological diagnose (such, for example, as interstitial keratitis) for ætiological diagnose (such as syphilitic, tuberculous, and leprous keratitis). SULZER.

GALEZOWSKI (625) describes a purulent conjunctivitis which appears in the course of influenza although he grants that a catarrhal conjunctivitis is more frequent. He mentions, also, a serous retinitis which he attributes to influenza. SULZER.

DIANOUX (626) collects his personal experiences in diabetic affections of the eye in a paper which presents many points of interest. The diabetic cataract develops only in the young, who are suffering from the acute pancreatic form of the disease [wrong—H. K.]. Chronic diabetes and acute diabetes in middle age do not cause cataract. Dianoux has seen several patients die a few days after operation for diabetic cataract, from pulmonary hemorrhage.

Retinal hemorrhages do not occur in young diabetic patients but in the middle-aged and particularly in the old. When they do occur there will always be found an advanced degree of arteriosclerosis. SULZER.

KLAUS (627) examined the brain of a patient with conjugate deviation of the eyes, seen in the Marburg clinic for internal medicine; his conclusions were as follows:

1. The centre for the voluntary latent movement of the two eyes (and of the head) lies in the location pointed out by Ferrier and others, viz., the post-frontal region, probably in the second and third frontal convolutions.

2. Other cortical regions may produce conjugate deviation by way of the reflexes, (a) from the visual sphere as a reflex movement after visual perception or light sensations, and (b) from the auditory sphere as a reflex movement after auditory perceptions.

KUNZ (628) reviews the literature, and adds two histories of tuberculosis of the eye, one being tuberculous iritis and the other ulcer of the palpebral conjunctiva. In Mayweg's clinic tuberculosis of the eye is found in 0.08 per cent. of patients.

Since Argyll Robertson first called attention to reflex iridoplegia in tabes this has come to be considered a very constant symptom and one of great diagnostic value. Erb was the first to show that the symptom might be intermittent. EICHHORST (629) reports two cases of this sort in detail. At times there was typical reflex iridoplegia; at others, normal pupils.

AXENFELD (630) describes the eye changes occurring in cerebro-spinal meningitis.

1. Conjunctivitis is frequent. A chemosis of the conjunctiva may appear, sometimes being due to an extension of the inflammation through the sphenoidal fissure into the orbit.

2. The frequency of basal meningeal exudation explains the muscular paralyses which are often seen, and which usually clear up later.

3. Pressure on the fifth nerve may lead to neuro-paralytic keratitis.

4. Of importance are those cases in which there is sudden complete blindness from inflammation or from pressure exerted by an exudation. The location of the lesion, whether basal or cortical, will be revealed by the state of the pupillary reaction.

5. The meningeal inflammation may extend down the nerve as a perineuritis.

When a purulent inflammation in the eye arises in the course of a purulent meningitis there may be three modes of development. Micro-organisms may have passed into the eye from the nerve sheaths, or have been present in such number in the orbit that their toxines have penetrated the eye, or, finally, there may have been a metastatic infection through the blood current.

NOTICES AND REVIEWS OF BOOKS.

XXIV. **Defective Eyesight.** The Principles of its Relief by Glasses. By D. B. St. John Roosa, Professor New York Postgraduate Medical School and Hospital, Surgeon Manhattan Eye and Ear Hospital, etc. New York: The Macmillan Co. (66 Fifth Avenue); London: Macmillan & Co., 1899. Price, $1.

This is a very neatly gotten-up small-octavo volume of 193 pages, with 36 text illustrations, and a set of Snellen's test types, in English, for examination of both near and distant vision. It appeals to the ophthalmic practitioner, but also to the general physician who wants to familiarize himself with the diagnosis and management of the errors of refraction, especially the proper selection of spectacles. The text from the beginning to the end is distinguished by remarkable clearness, all mathematical and physical difficulties being avoided. The book is practical throughout. The methods of examination are minutely described, with a view to self-instruction, yet where this appears difficult, as, for instance, in the use of the ophthalmometer, the student is informed of the desirability of having a tutor. A small trial case, at the price of about $12, would do to diagnose and treat uncomplicated cases, but is by no means sufficient for the practitioner who desires to be able accurately to fit any given case. Chapter i. treats of the measurement of the visual power. Chapter ii., of presbyopia, with an introduction on the invention of spectacles, and the mechanism of accommodation; then follows the description of simple presbyopia, and its combination with the various kinds of anomalous refraction, myopia, hyperopia, and astigmatism. At the end of the chapter, the so-called "second sight" of old people is mentioned. "It is not a blessing, but usually a stage in a disease of the lens—a swelling. This, of course, makes the eye myopic." As far as the reviewer knows,

this myopia is in all cases a sclerosis of the nucleus of the lens, which need not be, and in his experience mostly is not, accompanied by swelling of the lens. The myopia explains itself by the fact that a lens the concentric layers of which increase in density from the periphery to the centre, has a greater refractive power than a homogeneous lens having throughout the density of the densest part of its nucleus.

In Chapter iii., Myopia, stress is laid on the necessity of examining the eye for organic causes of amblyopia ; viz., opacities of cornea and lens (examined with oblique illumination), opacities of the vitreous, and fundus diseases, requiring experience in ophthalmoscopy. In cases suspicious of artificial myopia, *i. e.*, spasm of accommodation, especially in children, sulphate of atropia (gr. 4 : ℥ 1) should be instilled into each eye after each meal, for two or three days. The correctly determined glasses should be worn pretty constantly. In low degrees of hypermetropia, Chapter iv., of otherwise healthy eyes, glasses need not be used for distant vision, even if asthenopic symptoms are present. It is different when hyperopia is combined with astigmatism, either with or against the rule. The detection of astigmatism, even if S is $\frac{1}{60}$, is important.

Chapter v.—Corneal Astigmatism. "In astigmatism with the rule, in young persons, even if a considerable degree of hyperopia co-exist, as it almost always does, it is sufficient to allow one half of a dioptre to be corrected by the action of the crystalline lens in accommodation, and to correct the remainder by a glass." This chapter contains an excellent description of the use of the ophthalmometer. The author relies chiefly on the results obtained with this instrument.

Chapter vi.—Asthenopia. This distressing symptom, according to the author, may have its cause in anomalies of refraction or constitutional diseases, especially neuroses. He does not, and never did, recognize in lack of muscular balance the cause of asthenopia. Chapter vii. contains general remarks on lenses, recommending periscopic and toric lenses as superior to the biconvex or biconcave, being lighter, and lacking the distortion when people see through their edges.

What the book offers is good and to the point. The practical rules governing the detection of errors of refraction and the selection and use of glasses, are supplemented, school-booklike, by a sufficient number of illustrative cases, an excellent feature for

those desirous of drilling themselves, which in this department is as necessary as in any other. What, in the reviewer's judgment, should be taken exception to, is the too pronounced personal standpoint of the author. We agree with him that the lack of muscular balance as a factor in the production of asthenopia has, especially in recent American literature, been exaggerated, but we are far from totally denying it, as the author seems to do. Of the objective methods of determining the refractive state of the eye, the opthalmoscope is only incidentally mentioned, and the method by retinoscopy completely ignored, though by competent observers it is declared the most accurate and easiest to learn. Surely it has become the most popular, and has the advantage over ophthalmometry of being simpler, and of measuring the refraction of the whole eye and not, as the ophthalmometer, only that of the cornea; in fact, the ophthalmometer measures only the refractive difference of the corneal meridians. This, no doubt, is a great deal, and the reviewer, from personal experience, fully agrees with the author that it is easy to add the necessary spherical lens when, in any given case, the astigmatism of the cornea is ascertained. The strongly marked individuality of the author makes the little book very attractive, and will, despite some omissions, secure for it a good deal of deserved popularity.

H. K.

XXV. **Leçons de Clinique Opthalmologique,** Professées à l' Hôtel-Dieu par PH. PANAS, Professeur de Clinique Ophthalmologique à la Faculté de Médecine, Chirurgien de l' Hôtel-Dieu, Membre de l' Académie de Médecine. Recueillies et Publiées par le Dr. A. CASTAN (de Bégiers). Paris, Masson & Cie. Editeurs, 1899. 1 vol. in 8°, broché; frs. 5.

We are indebted to Dr. Castan for having compiled and edited the course of lectures delivered at the Hôtel-Dieu, in Paris, by Prof. Panas. It is an excellent custom of the prominent professors of the Paris Medical Faculty to write out and publish, or have compiled and published by an able assistant, their lectures at the hospitals or in the École de Médecine. The reviewer has an ineffaceable recollection of a course on experimental physiology which in his student days was given at the Sorbonne by Claude Bernard, and centred in the discovery of the glycogenic function of the liver. The experiments were the essential feature of the course, but the methods of experimentation and the results afterward published were an invaluable help to the comprehension

and remembrance of what the students had seen and heard. It is the same with clinical courses where the patients, the diagnoses and treatment of their diseases, form the essential feature of the course, but the published analyses, comments, and critical remarks are an invaluable supplement to the diagnostic and operative procedures of the cases, not only for those present, but for a much wider circle who will with interest and benefit read what is the opinion of the representative teachers of the Paris Faculty to-day.

The present volume of 322 pages, neatly gotten up, in easy and colloquial style, always in good taste, is a good sample of the above custom of the Paris teachers. In fifty-six lectures it treats of a multitude of ophthalmic subjects, of which we can mention only a few. The introductory lecture treats of the complexity of the ocular pathology, showing what a vast amount of anatomy, physiology, and pathology is exemplified in the little organ of sight. The professor dwells on the significance of laboratory work as a constant companion of the clinic, and of the importance of embryological studies to understand the nutritive and secretory processes of the eye. He ascribes to the outer layers of the retina, the secretion of the vitreous and the nutrition of the lens, as well as the production of the retinal purple. He says, however, that the clinique is the starting-point and the final object of the laboratory studies. The lectures are all interesting reading. We mention: surgical treatment of entropion and trichiasis; summer conjunctivitis; tenonitis and double orchitis; the sarcomas of the orbit; orbital exostoses; wounds and concussions of the orbit; pathogenesis and treatment of functional strabismus; bullous keratitis; pathogenesis and treatment of hypopyon; Hutchinson's keratitis; keratoconus; serous iridochoroiditis; syph. gummas of the eye; affections of the lens; hemorrhage of the vitreous; retinal affections, 6 lectures; optic nerve, 6 also; motor nerves, 2; and general considerations 3 lectures.

XXVI. **A Text-Book of Ophthalmology.** By Dr. ERNEST FUCHS, Professor of Ophthalmology in the University of Vienna. Authorized translation, revised from the seventh enlarged and improved German edition by A. DUANE, M.D., Assistant Surgeon Ophthalmic and Aural Institute. Second American edition. Octavo, 860 pages, with 275 illustrations. Price, cloth, $5; sheep, $6. Sold by subscription. D. Appleton & Co., 72 Fifth Avenue, New York.

This work may be considered as the standard text-book of to-day. The present edition is thoroughly revised and brought up to date, which is particularly noticeable in the pathology of corneal diseases,—serpent ulcer, hypopyon, etc. The treatise begins with the examination of the eye. Chapter I: Physical examination ; ophthalmoscopy in all its bearings. Chapter II : Functional examination. Cerebral and peripheric (field of) vision, light sense, etc. The organic diseases, which begin with the diseases of the conjunctiva, Chapter III, are always introduced with a concise, very clear, and well-illustrated description of the anatomy of the part. This is one of the strong features of the book. The same must be said of the physiological introductions and explanations of the functional diseases. Chapter IV, anatomy and physiology of the uvea and embryology of the eye, is particularly to be recommended, containing the circulation and nutrition of the eye, and the minute anatomy of the parts on the basis of the latest microscopic researches. The pathology, symptomatology, and treatment are presented with great care, but avoiding unnecessary length. The reviewer knows of no text-book on ophthalmology —and there are many excellent ones—that is so harmoniously prepared, and represents modern ophthalmology so completely as the work of Fuchs. It is chiefly a book for the eye specialist, but may confidently be recommended also to the student, the finer details being set in smaller type which the student may only glance over, reserving a closer study when he is more advanced. In Austria the ophthalmological requirements in the final examination are more extensive than in most other countries, which fact accounts for the popularity of so large a work as a student's text-book,—seven editions in less than ten years.

Dr. Duane, with his well-known facility and accuracy of language deserves the thanks of the English-speaking physicians for his admirable translation, to which he has made some valuable additions, in particular the paragraph on heterophoria, and the use of homatropine and other cycloplegics, and the general subject of the correction of refractive errors. As to the typography of the work, the reviewer finds that it is scarcely equal to the German original.

H. K.

NOTE OF CORRECTION.

In our last number we stated that Dr. HERMANN SNELLEN, JR., had been appointed Associate Professor of Ophthalmology, at the University of Utrecht. The appointment was "Professor of Ophthalmology," succeeding his father, who retired to gain more time for clinical work at the new Ophthalmic Hospital at Utrecht.

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